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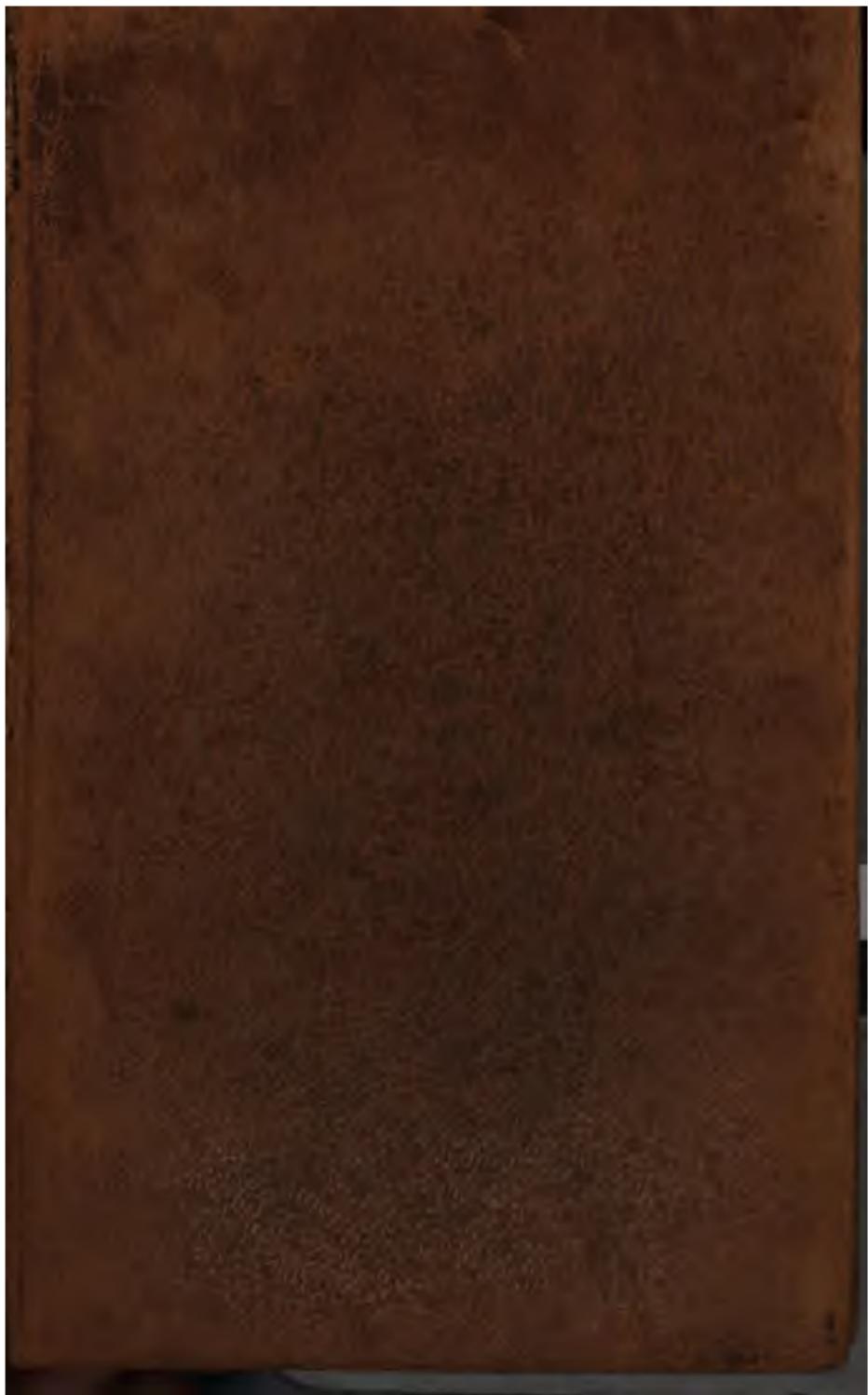
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PORTER'S
NEW SYSTEM
OF
MATHEMATICS,

WITH THE ADDITION OF A
COMPLETE READY RECKONER,

FOR THE USE OF
FARMERS, MECHANICS, &c.

NEW YORK:
PRINTED BY WILLIAM H. COLYER,
No. 5 HAGUE-STREET.

1841.

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P R E F A C E.

THE science of numbers is universally conceded to be an important one to every class in the community. In its cultivation and attainment *all* are deeply interested. The merchant, the mechanic, the professional man, the manufacturer, agriculturist, and labourer also require, in a greater or less degree, an acquaintance with its principles, on a correct understanding of which depend their prosperity in the prosecution of their several pursuits. The intricacies that have entered into this branch of necessary knowledge, have deterred many from undertaking its successful acquisition. The labour, the time, the study required to achieve a complete mastery over numerical science, interpose formidable objections to the system that has been so long established ; which, although it commands respect for its age, yet its numberless defects furnish often almost insurmountable difficulties to its easy and rapid attainment.

To reduce the science of numbers to a greater degree of simplicity and facility of acquisition ; to introduce into the plan of antiquated theories an easier, a surer, and quicker method of computation, is an important desideratum, one that necessarily interest the actors in every department of business, and recommends itself to the favourable consideration of the community.

Many, who have in some measure thrown off the shackles of prejudice, and have endeavoured to become reformers in this interesting field of enterprise, have failed substantially in accomplishing any very important results. They who would be improvers in oral, mental, and practical arithmetic and mathematics, have not as yet been able, with all their investigation, to present to the world a plan, by

means of which these branches of science may be taught by a simplified method, and communicated with facility and precision to the understandings of the learners.

To remedy these defects, and to supply the means for facilitating the acquisition of arithmetical and mathematical knowledge, has engaged much of the time and attention of the author of this work: the persevering efforts made have been crowned with complete success; and the author begs leave to tender his congratulations to the public on the important improvement thereby made to the cause of arithmetical and mathematical science, whereby its acquisition is rendered more easy and more certain, requires much less time in its practical operations than heretofore, and reduces it to so simple a system, that even the most obtuse understanding can readily comprehend its principles. The saving of time is always an important item in the calculation of business; and the more rapidly correct computative results can be arrived at, the better for those who have embarked in their transaction.

This important improvement in the science of numbers, by which much time is saved and greater certainty obtained, is now about to be introduced to the public, for their approbation and acceptance.

By way of exposition, it is necessary to state, that the whole of the principles of the science generally are contained and expressed in three words, *viz.*

INCREASE. DECREASE. EQUALITY.

Increase and decrease comprise addition, subtraction, multiplication, and division. Equality is the answer required, fixed by the question propounded under two different names, after which it is represented or expressed by a statement or equation, reduced by increase and decrease to the lowest term, equality, or the answer required. The science thus far concentrated, nothing remains but to simplify expressions or statements, to facilitate increase and decrease, which constitute the purport of the present publication.

PREFACE. ▼

It is expected that the fundamental principles of the science will be taught by gradual and persevering practice ; it will liberate the minds of the teachers from the imperious necessity of propounding useless and irrelevant questions, and conduct the understanding along the avenues of knowledge, until the principles in which the science is based are fully understood. A progressive and reasonable instruction will enable teachers to make pupils of every grade in society perfectly acquainted, at the age of twelve years, with the science generally, adapted completely to the attainment and prosecution of mercantile, mechanical, and mathematical knowledge.

For a number of years it was the constant study of the author to bring into organic operation his simplified plan of instruction, as regulated by his fundamental principles.

This method of calculation affords the power of performing calculations in whole numbers, even when the question is composed of whole fractions, or number and fractions. By an easy process in the statement the fractions are rejected, the solution or calculation is performed by the pure proportion of all variation of measure, weight, money, &c., of the whole world, entirely by whole numbers and in an uninterrupted series. It teaches to obtain, by a succession of pure proportion, an answer to any arithmetical proportional question proposed. The rule of three, or the rule of proportion, named also the "golden rule," has not this power. By this rule we are often compelled to make four, five, and more statements before we are able to obtain the answer required. These proceedings, by the common rule of calculation with fractions, render the process circumstantial and confused to the scholar, and difficult to impress on his memory ; but the rule of pure proportion teaches, in an easy, agreeable, and unavoidable manner, all the rules in general, as rule of three, tare, barter, fellowship, interest, reduction, loss and gain, exchange, and others ; and even in the solution and statements of these questions, wherein it is now necessary to employ

several of these rules, the rule of pure proportion will suffice ; and it also performs the calculation always without interruption, and in whole numbers. By this rule all circumstantial calculation of fractional numbers are avoided, and, by the shortness in whole numbers, more agreeable too, than the circumstantial calculation with compound numbers ; and it may be said, without hesitation, that the rule of pure proportion affords, in all business of common life, the same easiness as the decimal system does in the science of mathematics.

To enlarge this work by a long preface is not the intention of its author. It may speak for itself. It will be found, on examination, to do what it professes, viz., to teach an easy method of calculation, and to afford interesting and necessary knowledge to all men of business.

The pupil, even when he walks out for recreation, will find a subject for his thoughts and an agreeable little companion in this work. The amusing variation will afford to the scholar principles which will enable and animate him to perform questions hitherto unknown in any system of arithmetic ; by the knowledge of pure proportion and true judgment, which this system of figures gives of fractions, the young pupil becomes, in the course of his studies, better prepared for the higher branches of mathematics, and the tutors will not have half the trouble to ingraft durable principles of calculation on his memory.

Finally, it may be observed, that the author of this method of calculation has shown a fixed rule, that will not be found in any system of arithmetic—a rule to find the pure proportion of all things. Besides, he has adjusted the necessary pure proportions in a few pages at the end of the work, and placed there also a few sheets of writing paper, for the purpose that new pure proportions, desired and found after this rule, may be neatly traced thereon.

THE AUTHOR.

**PORTEUR'S
NEW SYSTEM
OF
MATHEMATICS.**

ARITHMETIC.

ARITHMETIC is the art or science of computing by numbers, and consists both in Theory and Practice. The Theory considers the nature and quality of numbers, and demonstrates the reason of practical operations. The Practice is that which shows the method of working by numbers, so as to be most useful and expeditious for business, and is comprised under five principal or fundamental rules, viz., *Nomination or Numeration, Addition, Subtraction, Multiplication, and Division*; the knowledge of which is so necessary, that scarcely anything in life, and nothing in trade, can be done without it.

NUMERATION

TEACHETH to express any proposed number by these ten characters: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9—0 is called a cipher, and the rest figures, or digits; the relative value of which depends upon the place they stand in when joined together, beginning at the right hand, as in the following

TABLE.

Hundreds of Millions.	Tens of Millions.	Millions.	Hundreds of Thousands.	Tens of Thousands.	Thousands.	Hundreds.	Tens.	Units.
9	8	7	6	5	4	3	2	1

Though the table consists of only nine places, yet it may be extended to more places at pleasure ; as, after hundreds of millions, read thousands of millions, ten thousands of millions, hundred thousands of millions, billions, trillions, quadrillions, quintillions, sextillions, septillions, octillions, nonillions, decillions, undecillions, &c., as in the following example :

Quadrillions. Trillions. Billions. Millions. Units.

567 890	707 928	679 437	963 897	234 278
~~~~~	~~~~~	~~~~~	~~~~~	~~~~~

## To write down numbers.

*Rule.* Write down the figures as their values are expressed, and supply any deficiency in the order with ciphers.

## EXAMPLE.

Write down the following numbers in order :

Twenty-nine.

Two hundred and forty-six.

Six thousand nine hundred and one.

Eighty-four thousand three hundred and nine.

Six millions two hundred and sixty-eight.

Eighty-nine millions and ninety.

Four millions four hundred thousand.

Nine hundred and nine millions.

Seventy millions seventy thousand and seventy.

Twelve hundred and forty-six millions.

Eight hundred millions forty-four thousand.

Two thousand five hundred and forty-three millions, four hundred and thirty-one thousand.

Sixty-nine hundred, nine thousand and seventy-five.

## SIMPLE ADDITION

TEACHETH to collect numbers of the same denomination into one sum.

*Rule.* Place the numbers under each other, so that units may stand under units, tens under tens, and so on, and draw a line under them. Add the first row, or right-hand column, and find how many tens are contained in them; set down the remainder, and carry as many units or ones to the next column, as there are tens. In like manner, carry the tens of each column, till the whole be finished.

*Proof.* Begin at the top of the sum and reckon the figures downward, in the same manner as they were added upward; and, if it be right, this aggregate will be equal to the first: or, cut off the upper line of figures, and find the amount of the rest; then, if the amount and upper line, when added, be equal to the sum total, the work is right.

## ADDITION TABLE.

2	and	1	are	3	3	and	1	are	4
2	"	2	"	4	3	"	2	"	5
2	"	3	"	5	3	"	3	"	6
2	"	4	"	6	3	"	4	"	7
2	"	5	"	7	3	"	5	"	8
2	"	6	"	8	3	"	6	"	9
2	"	7	"	9	3	"	7	"	10
2	"	8	"	10	3	"	8	"	11
2	"	9	"	11	3	"	9	"	12
2	"	10	"	12	3	"	10	"	13
2	"	11	"	13	3	"	11	"	14
2	"	12	"	14	3	"	12	"	15
2	"	13	"	15	3	"	13	"	16
2	"	14	"	16	3	"	14	"	17
2	"	15	"	17	3	"	15	"	18
2	"	16	"	18	3	"	16	"	19
2	"	17	"	19	3	"	17	"	20
2	"	18	"	20	3	"	18	"	21
2	"	19	"	21	3	"	19	"	22
2	"	20	"	22	3	"	20	"	23

## SIMPLE ADDITION.

4	and	1	are	5
4	"	2	"	6
4	"	3	"	7
4	"	4	"	8
4	"	5	"	9
4	"	6	"	10
4	"	7	"	11
4	"	8	"	12
4	"	9	"	13
4	"	10	"	14
4	"	11	"	15
4	"	12	"	16
4	"	13	"	17
4	"	14	"	18
4	"	15	"	19
4	"	16	"	20
4	"	17	"	21
4	"	18	"	22
4	"	19	"	23
4	"	20	"	24

5	and	1	are	6
5	"	2	"	7
5	"	3	"	8
5	"	4	"	9
5	"	5	"	10
5	"	6	"	11
5	"	7	"	12
5	"	8	"	13
5	"	9	"	14
5	"	10	"	15
5	"	11	"	16
5	"	12	"	17
5	"	13	"	18
5	"	14	"	19
5	"	15	"	20
5	"	16	"	21
5	"	17	"	22
5	"	18	"	23
5	"	19	"	24
5	"	20	"	25

6	and	1	are	7
6	"	2	"	8
6	"	3	"	9
6	"	4	"	10
6	"	5	"	11
6	"	6	"	12
6	"	7	"	13
6	"	8	"	14
6	"	9	"	15
6	"	10	"	16
6	"	11	"	17
6	"	12	"	18
6	"	13	"	19
6	"	14	"	20
6	"	15	"	21
6	"	16	"	22
6	"	17	"	23
6	"	18	"	24
6	"	19	"	25
6	"	20	"	26

7	and	1	are	8
7	"	2	"	9
7	"	3	"	10
7	"	4	"	11
7	"	5	"	12
7	"	6	"	13
7	"	7	"	14
7	"	8	"	15
7	"	9	"	16
7	"	10	"	17
7	"	11	"	18
7	"	12	"	19
7	"	13	"	20
7	"	14	"	21
7	"	15	"	22
7	"	16	"	23
7	"	17	"	24
7	"	18	"	25
7	"	19	"	26
7	"	20	"	27

8	and	1	are	9	9	and	1	are	10
8	"	2	"	10	9	"	2	"	11
8	"	3	"	11	9	"	3	"	12
8	"	4	"	12	9	"	4	"	13
8	"	5	"	13	9	"	5	"	14
8	"	6	"	14	9	"	6	"	15
8	"	7	"	15	9	"	7	"	16
8	"	8	"	16	9	"	8	"	17
8	"	9	"	17	9	"	9	"	18
8	"	10	"	18	9	"	10	"	19
8	"	11	"	19	9	"	11	"	20
8	"	12	"	20	9	"	12	"	21
8	"	13	"	21	9	"	13	"	22
8	"	14	"	22	9	"	14	"	23
8	"	15	"	23	9	"	15	"	24
8	"	16	"	24	9	"	16	"	25
8	"	17	"	25	9	"	17	"	26
8	"	18	"	26	9	"	18	"	27
8	"	19	"	27	9	"	19	"	28
8	"	20	"	28	9	"	20	"	29

10	and	1	are	11	11	and	1	are	12
10	"	2	"	12	11	"	2	"	13
10	"	3	"	13	11	"	3	"	14
10	"	4	"	14	11	"	4	"	15
10	"	5	"	15	11	"	5	"	16
10	"	6	"	16	11	"	6	"	17
10	"	7	"	17	11	"	7	"	18
10	"	8	"	18	11	"	8	"	19
10	"	9	"	19	11	"	9	"	20
10	"	10	"	20	11	"	10	"	21
10	"	11	"	21	11	"	11	"	22
10	"	12	"	22	11	"	12	"	23
10	"	13	"	23	11	"	13	"	24
10	"	14	"	24	11	"	14	"	25
10	"	15	"	25	11	"	15	"	26
10	"	16	"	26	11	"	16	"	27
10	"	17	"	27	11	"	17	"	28
10	"	18	"	28	11	"	18	"	29
10	"	19	"	29	11	"	19	"	30
10	"	20	"	30	11	"	20	"	31

## SIMPLE ADDITION.

12 and 1 are 13  
 12 " 2 " 14  
 12 " 3 " 15  
 12 " 4 " 16  
 12 " 5 " 17  
 12 " 6 " 18  
 12 " 7 " 19  
 12 " 8 " 20  
 12 " 9 " 21  
 12 " 10 " 22  
 12 " 11 " 23  
 12 " 12 " 24  
 12 " 13 " 25  
 12 " 14 " 26  
 12 " 15 " 27  
 12 " 16 " 28  
 12 " 17 " 29  
 12 " 18 " 30  
 12 " 19 " 31  
 12 " 20 " 32

14 and 1 are 15  
 14 " 2 " 16  
 14 " 3 " 17  
 14 " 4 " 18  
 14 " 5 " 19  
 14 " 6 " 20  
 14 " 7 " 21  
 14 " 8 " 22  
 14 " 9 " 23  
 14 " 10 " 24  
 14 " 11 " 25  
 14 " 12 " 26  
 14 " 13 " 27  
 14 " 14 " 28  
 14 " 15 " 29  
 14 " 16 " 30  
 14 " 17 " 31  
 14 " 18 " 32  
 14 " 19 " 33  
 14 " 20 " 34

13 and 1 are 14  
 13 " 2 " 15  
 13 " 3 " 16  
 13 " 4 " 17  
 13 " 5 " 18  
 13 " 6 " 19  
 13 " 7 " 20  
 13 " 8 " 21  
 13 " 9 " 22  
 13 " 10 " 23  
 13 " 11 " 24  
 13 " 12 " 25  
 13 " 13 " 26  
 13 " 14 " 27  
 13 " 15 " 28  
 13 " 16 " 29  
 13 " 17 " 30  
 13 " 18 " 31  
 13 " 19 " 32  
 13 " 20 " 33

15 and 1 are 16  
 15 " 2 " 17  
 15 " 3 " 18  
 15 " 4 " 19  
 15 " 5 " 20  
 15 " 6 " 21  
 15 " 7 " 22  
 15 " 8 " 23  
 15 " 9 " 24  
 15 " 10 " 25  
 15 " 11 " 26  
 15 " 12 " 27  
 15 " 13 " 28  
 15 " 14 " 29  
 15 " 15 " 30  
 15 " 16 " 31  
 15 " 17 " 32  
 15 " 18 " 33  
 15 " 19 " 34  
 15 " 20 " 35

16 and 1 are 17  
 16 " 2 " 18  
 16 " 3 " 19  
 16 " 4 " 20  
 16 " 5 " 21  
 16 " 6 " 22  
 16 " 7 " 23  
 16 " 8 " 24  
 16 " 9 " 25  
 16 " 10 " 26  
 16 " 11 " 27  
 16 " 12 " 28  
 16 " 13 " 29  
 16 " 14 " 30  
 16 " 15 " 31  
 16 " 16 " 32  
 16 " 17 " 33  
 16 " 18 " 34  
 16 " 19 " 35  
 16 " 20 " 36

17 and 1 are 18  
 17 " 2 " 19  
 17 " 3 " 20  
 17 " 4 " 21  
 17 " 5 " 22  
 17 " 6 " 23  
 17 " 7 " 24  
 17 " 8 " 25  
 17 " 9 " 26  
 17 " 10 " 27  
 17 " 11 " 28  
 17 " 12 " 29  
 17 " 13 " 30  
 17 " 14 " 31  
 17 " 15 " 32  
 17 " 16 " 33  
 17 " 17 " 34  
 17 " 18 " 35  
 17 " 19 " 36  
 17 " 20 " 37

18 and 1 are 19  
 18 " 2 " 20  
 18 " 3 " 21  
 18 " 4 " 22  
 18 " 5 " 23  
 18 " 6 " 24  
 18 " 7 " 25  
 18 " 8 " 26  
 18 " 9 " 27  
 18 " 10 " 28  
 18 " 11 " 29  
 18 " 12 " 30  
 18 " 13 " 31  
 18 " 14 " 32  
 18 " 15 " 33  
 18 " 16 " 34  
 18 " 17 " 35  
 18 " 18 " 36  
 18 " 19 " 37  
 18 " 20 " 38

19 and 1 are 20  
 19 " 2 " 21  
 19 " 3 " 22  
 19 " 4 " 23  
 19 " 5 " 24  
 19 " 6 " 25  
 19 " 7 " 26  
 19 " 8 " 27  
 19 " 9 " 28  
 19 " 10 " 29  
 19 " 11 " 30  
 19 " 12 " 31  
 19 " 13 " 32  
 19 " 14 " 33  
 19 " 15 " 34  
 19 " 16 " 35  
 19 " 17 " 36  
 19 " 18 " 37  
 19 " 19 " 38  
 19 " 20 " 39

20	and	1	are	21	20	and	11	are	31
20	"	2	"	22	20	"	12	"	32
20	"	3	"	23	20	"	13	"	33
20	"	4	"	24	20	"	14	"	34
20	"	5	"	25	20	"	15	"	35
20	"	6	"	26	20	"	16	"	36
20	"	7	"	27	20	"	17	"	37
20	"	8	"	28	20	"	18	"	38
20	"	9	"	29	20	"	19	"	39
20	"	10	"	30	20	"	20	"	40

## EXAMPLES.

(1.)

$$\begin{array}{r}
 4 \\
 - \\
 7 \\
 9 \\
 3 \\
 6 \\
 \hline
 29
 \end{array}$$

(2.)

$$\begin{array}{r}
 22 \\
 33 \\
 44 \\
 55 \\
 66 \\
 \hline
 220
 \end{array}$$

(3.)

$$\begin{array}{r}
 2345 \\
 2345 \\
 4352 \\
 5432 \\
 6625 \\
 \hline
 21099
 \end{array}$$

(4.)

$$\begin{array}{r}
 6784 \\
 2936 \\
 7963 \\
 8388 \\
 9762 \\
 9184 \\
 \hline
 \hline
 \end{array}$$

(5.)

$$\begin{array}{r}
 647943972872 \\
 332489104377 \\
 648276643111 \\
 437765500448 \\
 394689289279 \\
 642792489463 \\
 \hline
 \hline
 \end{array}$$

Add the following sums:

6. 3784, 94, 96484, 04, 978649, 708.

(7.)

$$\begin{array}{r}
 3784 \\
 94 \\
 96484 \\
 04 \\
 978649 \\
 708
 \end{array}$$

(8.)

$$\begin{array}{r}
 947837 \\
 67210 \\
 3894 \\
 786 \\
 94
 \end{array}$$

(9.)

$$\begin{array}{r}
 3 \\
 47 \\
 689 \\
 3974 \\
 54796 \\
 8
 \end{array}$$

(10.)

$$\begin{array}{r}
 6894389439 \\
 8437730164 \\
 74444473655 \\
 3992679476 \\
 6792586539 \\
 7921124726 \\
 7439438679 \\
 8188676383 \\
 5467255246 \\
 4893693849 \\
 6343944428 \\
 4000393786 \\
 5786486428 \\
 4639487647 \\
 2374659286
 \end{array}$$

11. A man borrowed of his neighbour 30 dollars at one time, 106 at another, 67 at another, and 37 at another ; how much did he borrow in the whole ? *Ans. \$240.*

12. Four boys collected chestnuts ; John had 4096, Peter had 16784, Charles had 11590, and David 557 ; how many were there in the whole ? *Ans. 33027.*

13. Four boys, on counting their apples, found Andrew had 67, Bennet 11 more than Andrew, Charles had 101, and Daniel had 16 more than Charles ; how many had they all ?

14. The deluge happened 2348 years before the birth of our Saviour, and America was discovered 1492 years after it ; how many years intervened ?

15. A farmer raised, in one year, 60 bushels of oats, 940

bushels of wheat, 370 of corn, and 80 bushels of potatoes ; how many bushels did he raise in all ?

16. A gentleman has six debtors, A, B, C, D, E, and F : A owes him 500 dollars ; B owes him as much as A, and 90 dollars more ; C owes him as much as A and B both ; D owes him 67 dollars ; E owes him as much as D and A's debts amount to ; and F owes him 64 dollars more than the sum of A, B, C, D, and E's debts added together. What is the whole amount due him ?

17. Four thousand two hundred and sixty-nine is one-sixth of some number ; what is that number ?

18. The ship Mary has just arrived from London, and one-fourth of her cargo is worth six thousand eight hundred and four dollars ; what is the whole cargo worth ?

19. Sir Isaac Newton was born in the year 1642, and died in the eighty-fifth of his age ; in what year did he die ?

20. If four bushels of wheat make one barrel of flour ; and the price of wheat be one dollar per bushel ; what will 400 barrels of flour cost ?

21. King Charles the martyr was beheaded in the year 1648, and 130 years have elapsed since that period ; what year is it now ?

22. From the creation of the world to the flood was 1656 years ; from thence to the building of Solomon's temple was 1336 years ; thence to the birth of our Saviour was 1008 years ; in what year was the birth of Christ ? *Ans.* 4000.

23. A gentleman owns one-eighth of a bank, and his part is worth 26,000 dollars ; what is the value of the whole bank ?

*Ans.* \$208,000.

24. The ship Lion sailed from Boston, bound to the port of Liverpool, with a cargo consisting of merchandise and specie ; the value of the merchandise was 4444 dollars ; the value of the merchandise was one-fourth of the value of the specie, and the value of the specie was one-half of the value of the ship ; what was the value of the ship and cargo ?

*Ans.* \$57,772.

25. If the cargo of a ship is worth 14,678 dollars, and the value of the cargo only one-sixth of the ship ; what is the value of the ship and cargo ?

*Ans.* \$102,746.

26. Suppose the distance from A to B is 44 miles, and the distance from A to B is one-half the distance from B to C, and the distance from B to C is one-third of the distance

from C to D, and the distance from C to D is one-fourth of the distance from D to E, and the distance from D to E is one-sixth of the distance from E to F, and the distance from E to F is one-eighth of the distance from F to G ; require the distance from A to G ?

*Ans. 58,476 miles.*

### SIMPLE SUBTRACTION

TEACHETH to take a less number from a greater of the same denomination, and thereby show the difference.

The greater is called the minuend, and the less the subtrahend.

*Rule.* Place the subtrahend, or less number, under the minuend or greater, and subtract units from units, tens from tens, and so on ; if any figure of the subtrahend be greater than the corresponding one of the minuend, add ten to the upper figure, and then subtract the lower from the sum, set down the remainder, and carry one to the next figure of the subtrahend.

*Proof.* Add the remainder to the subtrahend, and if the sum is equal to the minuend, the work is right.

### SUBTRACTION TABLE.

1	from	1	leaves	0	2	from	2	leaves	0
1	"	2	"	1	2	"	3	"	1
1	"	3	"	2	2	"	4	"	2
1	"	4	"	3	2	"	5	"	3
1	"	5	"	4	2	"	6	"	4
1	"	6	"	5	2	"	7	"	5
1	"	7	"	6	2	"	8	"	6
1	"	8	"	7	2	"	9	"	7
1	"	9	"	8	2	"	10	"	8
1	"	10	"	9	2	"	11	"	9
1	"	11	"	10	2	"	12	"	10
1	"	12	"	11	2	"	13	"	11
1	"	13	"	12	2	"	14	"	12
1	"	14	"	13	2	"	15	"	13
1	"	15	"	14	2	"	16	"	14
1	"	16	"	15	2	"	17	"	15
1	"	17	"	16	2	"	18	"	16
1	"	18	"	17	2	"	19	"	17
1	"	19	"	18	2	"	20	"	18
1	"	20	"	19	2	"	21	"	19
1	"	21	"	20	2	"	22	"	20

## SIMPLE SUBTRACTION.

3	from	3	leaves	0	4	from	4	leaves	0
3	"	4	"	1	4	"	5	"	1
3	"	5	"	2	4	"	6	"	2
3	"	6	"	3	4	"	7	"	3
3	"	7	"	4	4	"	8	"	4
3	"	8	"	5	4	"	9	"	5
3	"	9	"	6	4	"	10	"	6
3	"	10	"	7	4	"	11	"	7
3	"	11	"	8	4	"	12	"	8
3	"	12	"	9	4	"	13	"	9
3	"	13	"	10	4	"	14	"	10
3	"	14	"	11	4	"	15	"	11
3	"	15	"	12	4	"	16	"	12
3	"	16	"	13	4	"	17	"	13
3	"	17	"	14	4	"	18	"	14
3	"	18	"	15	4	"	19	"	15
3	"	19	"	16	4	"	20	"	16
3	"	20	"	17	4	"	21	"	17
3	"	21	"	18	4	"	22	"	18
3	"	22	"	19	4	"	23	"	19
3	"	23	"	20	4	"	24	"	20
5	from	5	leaves	0	6	from	6	leaves	0
5	"	6	"	1	6	"	7	"	1
5	"	7	"	2	6	"	8	"	2
5	"	8	"	3	6	"	9	"	3
5	"	9	"	4	6	"	10	"	4
5	"	10	"	5	6	"	11	"	5
5	"	11	"	6	6	"	12	"	6
5	"	12	"	7	6	"	13	"	7
5	"	13	"	8	6	"	14	"	8
5	"	14	"	9	6	"	15	"	9
5	"	15	"	10	6	"	16	"	10
5	"	16	"	11	6	"	17	"	11
5	"	17	"	12	6	"	18	"	12
5	"	18	"	13	6	"	19	"	13
5	"	19	"	14	6	"	20	"	14
5	"	20	"	15	6	"	21	"	15
5	"	21	"	16	6	"	22	"	16
5	"	22	"	17	6	"	23	"	17
5	"	23	"	18	6	"	24	"	18
5	"	24	"	19	6	"	25	"	19
5	"	25	"	20	6	"	26	"	20

## SIMPLE SUBTRACTION.

19

7	from	7	leaves	0	8	from	8	leaves	0
7	"	8	"	1	8	"	9	"	1
7	"	9	"	2	8	"	10	"	2
7	"	10	"	3	8	"	11	"	3
7	"	11	"	4	8	"	12	"	4
7	"	12	"	5	8	"	13	"	5
7	"	13	"	6	8	"	14	"	6
7	"	14	"	7	8	"	15	"	7
7	"	15	"	8	8	"	16	"	8
7	"	16	"	9	8	"	17	"	9
7	"	17	"	10	8	"	18	"	10
7	"	18	"	11	8	"	19	"	11
7	"	19	"	12	8	"	20	"	12
7	"	20	"	13	8	"	21	"	13
7	"	21	"	14	8	"	22	"	14
7	"	22	"	15	8	"	23	"	15
7	"	23	"	16	8	"	24	"	16
7	"	24	"	17	8	"	25	"	17
7	"	25	"	18	8	"	26	"	18
7	"	26	"	19	8	"	27	"	19
7	"	27	"	20	8	"	28	"	20
9	from	9	leaves	0	10	from	10	leaves	0
9	"	10	"	1	10	"	11	"	1
9	"	11	"	2	10	"	12	"	2
9	"	12	"	3	10	"	13	"	3
9	"	13	"	4	10	"	14	"	4
9	"	14	"	5	10	"	15	"	5
9	"	15	"	6	10	"	16	"	6
9	"	16	"	7	10	"	17	"	7
9	"	17	"	8	10	"	18	"	8
9	"	18	"	9	10	"	19	"	9
9	"	19	"	10	10	"	20	"	10
9	"	20	"	11	10	"	21	"	11
9	"	21	"	12	10	"	22	"	12
9	"	22	"	13	10	"	23	"	13
9	"	23	"	14	10	"	24	"	14
9	"	24	"	15	10	"	25	"	15
9	"	25	"	16	10	"	26	"	16
9	"	26	"	17	10	"	27	"	17
9	"	27	"	18	10	"	28	"	18
9	"	28	"	19	10	"	29	"	19
9	"	29	"	20	10	"	30	"	20

## SIMPLE SUBTRACTION.

11	from	11	leaves	0	12	from	12	leaves	0
11	"	12	"	1	12	"	13	"	1
11	"	13	"	2	12	"	14	"	2
11	"	14	"	3	12	"	15	"	3
11	"	15	"	4	12	"	16	"	4
11	"	16	"	5	12	"	17	"	5
11	"	17	"	6	12	"	18	"	6
11	"	18	"	7	12	"	19	"	7
11	"	19	"	8	12	"	20	"	8
11	"	20	"	9	12	"	21	"	9
11	"	21	"	10	12	"	22	"	10
11	"	22	"	11	12	"	23	"	11
11	"	23	"	12	12	"	24	"	12
11	"	24	"	13	12	"	25	"	13
11	"	25	"	14	12	"	26	"	14
11	"	26	"	15	12	"	27	"	15
11	"	27	"	16	12	"	28	"	16
11	"	28	"	17	12	"	29	"	17
11	"	29	"	18	12	"	30	"	18
11	"	30	"	19	12	"	31	"	19
11	"	31	"	20	12	"	32	"	20

13	from	13	leaves	0	14	from	14	leaves	0
13	"	14	"	1	14	"	15	"	1
13	"	15	"	2	14	"	16	"	2
13	"	16	"	3	14	"	17	"	3
13	"	17	"	4	14	"	18	"	4
13	"	18	"	5	14	"	19	"	5
13	"	19	"	6	14	"	20	"	6
13	"	20	"	7	14	"	21	"	7
13	"	21	"	8	14	"	22	"	8
13	"	22	"	9	14	"	23	"	9
13	"	23	"	10	14	"	24	"	10
13	"	24	"	11	14	"	25	"	11
13	"	25	"	12	14	"	26	"	12
13	"	26	"	13	14	"	27	"	13
13	"	27	"	14	14	"	28	"	14
13	"	28	"	15	14	"	29	"	15
13	"	29	"	16	14	"	30	"	16
13	"	30	"	17	14	"	31	"	17
13	"	31	"	18	14	"	32	"	18
13	"	32	"	19	14	"	33	"	19
13	"	33	"	20	14	"	34	"	20

## SIMPLE SUBTRACTION.

21

15	from	15	leaves	0	16	from	16	leaves	0
15	"	16	"	1	16	"	17	"	1
15	"	17	"	2	16	"	18	"	2
15	"	18	"	3	16	"	19	"	3
15	"	19	"	4	16	"	20	"	4
15	"	20	"	5	16	"	21	"	5
15	"	21	"	6	16	"	22	"	6
15	"	22	"	7	16	"	23	"	7
15	"	23	"	8	16	"	24	"	8
15	"	24	"	9	16	"	25	"	9
15	"	25	"	10	16	"	26	"	10
15	"	26	"	11	16	"	27	"	11
15	"	27	"	12	16	"	28	"	12
15	"	28	"	13	16	"	29	"	13
15	"	29	"	14	16	"	30	"	14
15	"	30	"	15	16	"	31	"	15
15	"	31	"	16	16	"	32	"	16
15	"	32	"	17	16	"	33	"	17
15	"	33	"	18	16	"	34	"	18
15	"	34	"	19	16	"	35	"	19
15	"	35	"	20	16	"	36	"	20
17	from	17	leaves	0	18	from	18	leaves	0
17	"	18	"	1	18	"	19	"	1
17	"	19	"	2	18	"	20	"	2
17	"	20	"	3	18	"	21	"	3
17	"	21	"	4	18	"	22	"	4
17	"	22	"	5	18	"	23	"	5
17	"	23	"	6	18	"	24	"	6
17	"	24	"	7	18	"	25	"	7
17	"	25	"	8	18	"	26	"	8
17	"	26	"	9	18	"	27	"	9
17	"	27	"	10	18	"	28	"	10
17	"	28	"	11	18	"	29	"	11
17	"	29	"	12	18	"	30	"	12
17	"	30	"	13	18	"	31	"	13
17	"	31	"	14	18	"	32	"	14
17	"	32	"	15	18	"	33	"	15
17	"	33	"	16	18	"	34	"	16
17	"	34	"	17	18	"	35	"	17
17	"	35	"	18	18	"	36	"	18
17	"	36	"	19	18	"	37	"	19
17	"	37	"	20	18	"	38	"	20

19	from	19	leaves	0	20	from	20	leaves	0
19	"	20	"	1	20	"	21	"	1
19	"	21	"	2	20	"	22	"	2
19	"	22	"	3	20	"	23	"	3
19	"	23	"	4	20	"	24	"	4
19	"	24	"	5	20	"	25	"	5
19	"	25	"	6	20	"	26	"	6
19	"	26	"	7	20	"	27	"	7
19	"	27	"	8	20	"	28	"	8
19	"	28	"	9	20	"	29	"	9
19	"	29	"	10	20	"	30	"	10
19	"	30	"	11	20	"	31	"	11
19	"	31	"	12	20	"	32	"	12
19	"	32	"	13	20	"	33	"	13
19	"	33	"	14	20	"	34	"	14
19	"	34	"	15	20	"	35	"	15
19	"	35	"	16	20	"	36	"	16
19	"	36	"	17	20	"	37	"	17
19	"	37	"	18	20	"	38	"	18
19	"	38	"	19	20	"	39	"	19
19	"	39	"	20	20	"	40	"	20

## EXAMPLES.

(1.)

$$\begin{array}{r} \text{From} \ 6 \ 4 \ 7 \ 8 \ 9 \\ \text{Take} \ 3 \ 2 \ 4 \ 3 \ 4 \\ \hline \text{Rem.} \ 3 \ 2 \ 3 \ 5 \ 5 \end{array}$$

(2.)

$$\begin{array}{r} 8 \ 9 \ 3 \ 5 \ 8 \ 6 \ 4 \ 8 \\ 8 \ 8 \ 3 \ 5 \ 6 \ 4 \ 3 \ 8 \\ \hline 1 \ 0 \ 0 \ 2 \ 2 \ 1 \ 0 \end{array}$$

(3.)

$$\begin{array}{r} 7 \ 4 \ 3 \ 9 \ 4 \ 3 \ 4 \ 6 \ 7 \ 8 \\ 6 \ 2 \ 7 \ 3 \ 1 \ 7 \ 2 \ 8 \ 4 \ 6 \\ \hline 1 \ 1 \ 6 \ 6 \ 2 \ 6 \ 1 \ 8 \ 3 \ 2 \end{array}$$

(4.)

$$\begin{array}{r} 8 \ 9 \ 2 \ 4 \ 3 \ 0 \ 1 \ 7 \ 3 \\ 6 \ 9 \ 7 \ 6 \ 4 \ 4 \ 6 \ 8 \ 7 \\ \hline 1 \ 9 \ 4 \ 7 \ 8 \ 5 \ 4 \ 8 \ 6 \end{array}$$

(5.)

$$\begin{array}{r} 6 \ 4 \ 9 \ 7 \ 9 \ 3 \ 8 \ 5 \ 6 \ 7 \\ 4 \ 6 \ 8 \ 3 \ 6 \ 8 \ 3 \ 7 \ 9 \ 8 \\ \hline \end{array}$$

(6.)

$$\begin{array}{r} 9 \ 0 \ 0 \ 0 \ 3 \ 7 \ 3 \ 4 \\ 4 \ 4 \ 4 \ 4 \ 6 \ 7 \ 3 \ 0 \\ \hline \end{array}$$

(7.)

$$\begin{array}{r} 4 \ 8 \ 6 \ 7 \ 3 \ 8 \ 6 \ 4 \ 9 \ 7 \\ 4 \ 7 \ 9 \ 8 \ 6 \ 4 \ 3 \\ \hline \end{array}$$

(8.)

$$\begin{array}{r} 3 \ 0 \ 0 \ 7 \ 7 \ 7 \ 8 \ 4 \ 6 \ 9 \ 3 \\ 9 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \\ \hline \end{array}$$

$$\begin{array}{r}
 (9.) \\
 4863594687 \\
 3000000186 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 (10.) \\
 2000000000 \\
 1999999999 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 (11.) \\
 1864370000 \\
 1 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 (12.) \\
 86438643748 \\
 85327532637 \\
 \hline
 \end{array}$$

13. A man, having 478 dollars, lost 149 dollars in gambling ; how many had he left ? *Ans. \$329.*

14. A gentleman bought a wagon for 108 dollars, and a harness for 42 dollars ; what did the wagon cost him more than the harness ? *Ans. \$66.*

15. If a man have 2476 dollars, and he spend 675 dollars of it ; how much will he have left ? *Ans. \$1801.*

16. A man bought a chaise for 214 dollars, and, to pay for it, gave a gig worth 47 dollars, and the rest in money ; how much money did he pay ? *Ans. \$167.*

17. America was discovered by Christopher Columbus in 1492 ; how many years had elapsed when hostilities commenced in the revolutionary war, 1775 ? *Ans. 283 years.*

18. General George Washington was born in 1732, and died in 1799 ; what was his age ? *Ans. 67 years.*

19. Sir Isaac Newton was born in 1642, and died in 1727 ; what was his age at the time of his death ? *Ans. 85 years.*

20. A man in the year 1820 was 67 years of age ; in what year was he born ? *Ans. 1753.*

21. What is the difference between twice twenty-seven and three times forty-five ? *Ans. 81.*

22. How much is 1200 greater than 365 and 721 added together ? *Ans. 114.*

23. From New London to Philadelphia is 240 miles. Now, if a man should travel five days, from New London toward Philadelphia, at the rate of 39 miles each day, how far would he then be from Philadelphia ? *Ans. 45 miles.*

24. What other number with these four, viz., 21, 32, 16, and 12, will make 100 ? *Ans. 19.*

25. A wine merchant bought 721 pipes of wine for 90,846 dollars, and sold 543 pipes thereof for 89,049 dollars ; how many pipes has he remaining or unsold, and what do they stand him in ? *Ans. 178 pipes, and \$1797.*

26. Joe Careless received prize-money to the amount of 1000 dollars, after which he lays out 411 dollars 41 cents for a span of fine horses, and 123 dollars 40 cents for a gold watch and a suit of new clothes, besides 359 dollars and 50 cents he lost in gambling; how much will he have left after paying his landlord's bill, which amounts to 85 dollars and 11 cents.

*Ans. \$20 58 cts.*

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### SIMPLE MULTIPLICATION

Is a compendious way of adding numbers of the same name.

The number to be multiplied is called the multiplicand.

The number which multiplies is called the multiplier.

The number arising from the operation is called the product.

*Rule.* Place the multiplier under the multiplicand, and multiply the latter successively by the significant figures of the former; if the multiplier consists of more figures than one, place the right hand figure of each product under the figure from which it arises; then add the several products, and their sum is the product of both factors, and the answer required.

### MULTIPLICATION TABLE.

2	times	1	are	2	3	times	1	are	3
2	"	2	"	4	3	"	2	"	6
2	"	3	"	6	3	"	3	"	9
2	"	4	"	8	3	"	4	"	12
2	"	5	"	10	3	"	5	"	15
2	"	6	"	12	3	"	6	"	18
2	"	7	"	14	3	"	7	"	21
2	"	8	"	16	3	"	8	"	24
2	"	9	"	18	3	"	9	"	27
2	"	10	"	20	3	"	10	"	30
2	"	11	"	22	3	"	11	"	33
2	"	12	"	24	3	"	12	"	36
2	"	13	"	26	3	"	13	"	39
2	"	14	"	28	3	"	14	"	42
2	"	15	"	30	3	"	15	"	45
2	"	16	"	32	3	"	16	"	48
2	"	17	"	34	3	"	17	"	51
2	"	18	"	36	3	"	18	"	54
2	"	19	"	38	3	"	19	"	57
2	"	20	"	40	3	"	20	"	60

4	times	1	are	4	5	times	1	are	5
4	"	2	"	8	5	"	2	"	10
4	"	3	"	12	5	"	3	"	15
4	"	4	"	16	5	"	4	"	20
4	"	5	"	20	5	"	5	"	25
4	"	6	"	24	5	"	6	"	30
4	"	7	"	28	5	"	7	"	35
4	"	8	"	32	5	"	8	"	40
4	"	9	"	36	5	"	9	"	45
4	"	10	"	40	5	"	10	"	50
4	"	11	"	44	5	"	11	"	55
4	"	12	"	48	5	"	12	"	60
4	"	13	"	52	5	"	13	"	65
4	"	14	"	56	5	"	14	"	70
4	"	15	"	60	5	"	15	"	75
4	"	16	"	64	5	"	16	"	80
4	"	17	"	68	5	"	17	"	85
4	"	18	"	72	5	"	18	"	90
4	"	19	"	76	5	"	19	"	95
4	"	20	"	80	5	"	20	"	100

6	times	1	are	6	7	times	1	are	7
6	"	2	"	12	7	"	2	"	14
6	"	3	"	18	7	"	3	"	21
6	"	4	"	24	7	"	4	"	28
6	"	5	"	30	7	"	5	"	35
6	"	6	"	36	7	"	6	"	42
6	"	7	"	42	7	"	7	"	49
6	"	8	"	48	7	"	8	"	56
6	"	9	"	54	7	"	9	"	63
6	"	10	"	60	7	"	10	"	70
6	"	11	"	66	7	"	11	"	77
6	"	12	"	72	7	"	12	"	84
6	"	13	"	78	7	"	13	"	91
6	"	14	"	84	7	"	14	"	98
6	"	15	"	90	7	"	15	"	105
6	"	16	"	96	7	"	16	"	112
6	"	17	"	102	7	"	17	"	119
6	"	18	"	108	7	"	18	"	126
6	"	19	"	114	7	"	19	"	133
6	"	20	"	120	7	"	20	"	140

## SIMPLE MULTIPLICATION.

8 times	1	are	8	9 times	1	are	9
8	"	2	"	16	9	"	2
8	"	3	"	24	9	"	3
8	"	4	"	32	9	"	4
8	"	5	"	40	9	"	5
8	"	6	"	48	9	"	6
8	"	7	"	56	9	"	7
8	"	8	"	64	9	"	8
8	"	9	"	72	9	"	9
8	"	10	"	80	9	"	10
8	"	11	"	88	9	"	11
8	"	12	"	96	9	"	12
8	"	13	"	104	9	"	13
8	"	14	"	112	9	"	14
8	"	15	"	120	9	"	15
8	"	16	"	128	9	"	16
8	"	17	"	136	9	"	17
8	"	18	"	144	9	"	18
8	"	19	"	152	9	"	19
8	"	20	"	160	9	"	20

10 times	1	are	10	11 times	1	are	11
10	"	2	"	20	11	"	2
10	"	3	"	30	11	"	3
10	"	4	"	40	11	"	4
10	"	5	"	50	11	"	5
10	"	6	"	60	11	"	6
10	"	7	"	70	11	"	7
10	"	8	"	80	11	"	8
10	"	9	"	90	11	"	9
10	"	10	"	100	11	"	10
10	"	11	"	110	11	"	11
10	"	12	"	120	11	"	12
10	"	13	"	130	11	"	13
10	"	14	"	140	11	"	14
10	"	15	"	150	11	"	15
10	"	16	"	160	11	"	16
10	"	17	"	170	11	"	17
10	"	18	"	180	11	"	18
10	"	19	"	190	11	"	19
10	"	20	"	200	11	"	20

12	times	1	are	12	13	times	1	are	13
12	"	2	"	24	13	"	2	"	26
12	"	3	"	36	13	"	3	"	39
12	"	4	"	48	13	"	4	"	52
12	"	5	"	60	13	"	5	"	65
12	"	6	"	72	13	"	6	"	78
12	"	7	"	84	13	"	7	"	91
12	"	8	"	96	13	"	8	"	104
12	"	9	"	108	13	"	9	"	117
12	"	10	"	120	13	"	10	"	130
12	"	11	"	132	13	"	11	"	143
12	"	12	"	144	13	"	12	"	156
12	"	13	"	156	13	"	13	"	169
12	"	14	"	168	13	"	14	"	182
12	"	15	"	180	13	"	15	"	195
12	"	16	"	192	13	"	16	"	208
12	"	17	"	204	13	"	17	"	221
12	"	18	"	216	13	"	18	"	234
12	"	19	"	228	13	"	19	"	247
12	"	20	"	240	13	"	20	"	260

14	times	1	are	14	15	times	1	are	15
14	"	2	"	28	15	"	2	"	30
14	"	3	"	42	15	"	3	"	45
14	"	4	"	56	15	"	4	"	60
14	"	5	"	70	15	"	5	"	75
14	"	6	"	84	15	"	6	"	90
14	"	7	"	98	15	"	7	"	105
14	"	8	"	112	15	"	8	"	120
14	"	9	"	126	15	"	9	"	135
14	"	10	"	140	15	"	10	"	150
14	"	11	"	154	15	"	11	"	165
14	"	12	"	168	15	"	12	"	180
14	"	13	"	182	15	"	13	"	195
14	"	14	"	196	15	"	14	"	210
14	"	15	"	210	15	"	15	"	225
14	"	16	"	224	15	"	16	"	240
14	"	17	"	238	15	"	17	"	255
14	"	18	"	252	15	"	18	"	270
14	"	19	"	266	15	"	19	"	285
14	"	20	"	280	15	"	20	"	300

## SIMPLE MULTIPLICATION.

16	times	1	are	16	17	times	1	are	17
16	"	2	"	32	17	"	2	"	34
16	"	3	"	48	17	"	3	"	51
16	"	4	"	64	17	"	4	"	68
16	"	5	"	80	17	"	5	"	85
16	"	6	"	96	17	"	6	"	102
16	"	7	"	112	17	"	7	"	119
16	"	8	"	128	17	"	8	"	136
16	"	9	"	144	17	"	9	"	153
16	"	10	"	160	17	"	10	"	170
16	"	11	"	176	17	"	11	"	187
16	"	12	"	192	17	"	12	"	204
16	"	13	"	208	17	"	13	"	221
16	"	14	"	224	17	"	14	"	238
16	"	15	"	240	17	"	15	"	255
16	"	16	"	256	17	"	16	"	272
16	"	17	"	272	17	"	17	"	289
16	"	18	"	288	17	"	18	"	306
16	"	19	"	304	17	"	19	"	323
16	"	20	"	320	17	"	20	"	340

18	times	1	are	18	19	times	1	are	19
18	"	2	"	36	19	"	2	"	38
18	"	3	"	54	19	"	3	"	57
18	"	4	"	72	19	"	4	"	76
18	"	5	"	90	19	"	5	"	95
18	"	6	"	108	19	"	6	"	114
18	"	7	"	126	19	"	7	"	133
18	"	8	"	144	19	"	8	"	152
18	"	9	"	162	19	"	9	"	171
18	"	10	"	180	19	"	10	"	190
18	"	11	"	198	19	"	11	"	209
18	"	12	"	216	19	"	12	"	228
18	"	13	"	234	19	"	13	"	247
18	"	14	"	252	19	"	14	"	266
18	"	15	"	270	19	"	15	"	285
18	"	16	"	288	19	"	16	"	304
18	"	17	"	306	19	"	17	"	323
18	"	18	"	324	19	"	18	"	342
18	"	19	"	342	19	"	19	"	361
18	"	20	"	360	19	"	20	"	380

20	times	1	are	20	20	times	11	are	220
20	"	2	"	40	20	"	12	"	240
20	"	3	"	60	20	"	13	"	260
20	"	4	"	80	20	"	14	"	280
20	"	5	"	100	20	"	15	"	300
20	"	6	"	120	20	"	16	"	320
20	"	7	"	140	20	"	17	"	340
20	"	8	"	160	20	"	18	"	360
20	"	9	"	180	20	"	19	"	380
20	"	10	"	200	20	"	20	"	400

## EXAMPLES.

(1.)

$$\begin{array}{r} 4 \ 3 \ 4 \ 1 \ 2 \ 3 \ 4 \ 3 \\ \hline 2 \end{array}$$

$$\begin{array}{r} 8 \ 6 \ 8 \ 2 \ 4 \ 6 \ 8 \ 6 \\ \hline \end{array}$$

(3.)

$$\begin{array}{r} 6 \ 4 \ 7 \ 8 \ 4 \ 6 \ 5 \ 6 \\ \hline 4 \end{array}$$

(5.)

$$\begin{array}{r} 6 \ 9 \ 7 \ 4 \ 3 \ 9 \ 7 \ 9 \ 4 \\ \hline 6 \ 4 \ 8 \end{array}$$

(2.)

$$\begin{array}{r} 3 \ 5 \ 6 \ 8 \ 3 \ 7 \ 5 \\ \hline 3 \end{array}$$

$$\begin{array}{r} 1 \ 0 \ 7 \ 0 \ 5 \ 1 \ 2 \ 5 \\ \hline \end{array}$$

(4.)

$$\begin{array}{r} 8 \ 6 \ 9 \ 6 \ 4 \ 6 \ 7 \ 9 \ 7 \\ \hline 2 \ 6 \end{array}$$

(6.)

$$\begin{array}{r} 9 \ 8 \ 7 \ 6 \ 5 \ 4 \ 3 \ 2 \ 1 \ 0 \\ \hline 4 \ 9 \ 8 \ 7 \ 6 \end{array}$$

7. What is the value of 29 pairs of men's shoes, at 1 dollar 51 cents per pair?

*Ans.* \$43,79 cts.

8. What cost 140 reams of paper, at 2 dollars 35 cents per ream?

*Ans.* \$329.

9. In one pipe of wine there are 126 gallons; how many gallons are there in 15 pipes?

*Ans.* 1890 galls.

10. A merchant bought at one time 278 barrels of fish; at another time three times as many, wanting 184 barrels, at 9 dollars per barrel; what did he pay for the whole?

*Ans.* \$8352.

11. A man bought 675 sheep, at 2 dollars 25 cents per head; also, 46 pigs, at 2 dollars per head; what did he pay for the whole?

*Ans.* \$1610,75 cts.

12. A gentleman bought 2428 barrels of flour at one time; at another time as many as at the first, wanting 987 barrels; he lost as many as he bought at the last time, wanting 764

barrels ; sold the remainder at 8 dollars per barrel ; what did they come to ? *Ans. \$25536.*

13. What will one year's board come to, at 6 dollars per week ? *Ans. \$312.*

14. What will 40,000 brick cost, at 3 dollars per thousand ? *Ans. \$120,000.*

### SIMPLE DIVISION

TEACHETH to find how often one number is contained in another of the same name.

The number to be divided is called the dividend.

The number by which to divide is called the divisor.

The number of times the divisor is contained in the dividend is called the quotient.

The remainder, if there be any, will always be less than the divisor.

*Rule.* On the right and left of the dividend draw a curved line, and write the divisor on the left hand, and the quotient, as it arises, on the right. Find how many times the divisor is contained in as many figures as are necessary in the dividend, and write the number in the quotient.

Multiply the divisor by the quotient figure, and set the product under that part of the dividend used.

Subtract the product last found from that part of the dividend under which it is placed, and to the right hand of the remainder bring down the next figure of the dividend ; divide this number as before, and so on, till the whole is finished. If it be necessary to bring down more figures than one to the remainder, in order to make it as large as the divisor, a cipher must be written in the quotient for every figure so brought down, till the number be sufficient to contain the divisor.

*Proof.* Multiply the quotient by the divisor, and to the product add the remainder, and the sum will be equal to the dividend, if the work is right. When there are ciphers annexed to the divisor, cut off the ciphers from it, and the same number of digits from the dividend, then divide the remaining figures by each other, as usual, the quotient is the answer ; and what remains, placed before the figures cut off, is the true remainder.

When the divisor does not exceed twelve, or is a composite number, or when ciphers may be cut off from it, the division may be shortened by multiplying and dividing mentally, and writing the quotient under the dividend.

2	in	2	1	time	3	in	3	1	time
2	"	4	2	"	3	"	6	2	"
2	"	6	3	"	3	"	9	3	"
2	"	8	4	"	3	"	12	4	"
2	"	10	5	"	3	"	15	5	"
2	"	12	6	"	3	"	18	6	"
2	"	14	7	"	3	"	21	7	"
2	"	16	8	"	3	"	24	8	"
2	"	18	9	"	3	"	27	9	"
2	"	20	10	"	3	"	30	10	"
2	"	22	11	"	3	"	33	11	"
2	"	24	12	"	3	"	36	12	"
2	"	26	13	"	3	"	39	13	"
2	"	28	14	"	3	"	42	14	"
2	"	30	15	"	3	"	45	15	"
2	"	32	16	"	3	"	48	16	"
2	"	34	17	"	3	"	51	17	"
2	"	36	18	"	3	"	54	18	"
2	"	38	19	"	3	"	57	19	"
2	"	40	20	"	3	"	60	20	"
4	in	4	1	time	5	in	5	1	time
4	"	8	2	"	5	"	10	2	"
4	"	12	3	"	5	"	15	3	"
4	"	16	4	"	5	"	20	4	"
4	"	20	5	"	5	"	25	5	"
4	"	24	6	"	5	"	30	6	"
4	"	28	7	"	5	"	35	7	"
4	"	32	8	"	5	"	40	8	"
4	"	36	9	"	5	"	45	9	"
4	"	40	10	"	5	"	50	10	"
4	"	44	11	"	5	"	55	11	"
4	"	48	12	"	5	"	60	12	"
4	"	52	13	"	5	"	65	13	"
4	"	56	14	"	5	"	70	14	"
4	"	60	15	"	5	"	75	15	"
4	"	64	16	"	5	"	80	16	"
4	"	68	17	"	5	"	85	17	"
4	"	72	18	"	5	"	90	18	"
4	"	76	19	"	5	"	95	19	"
4	"	80	20	"	5	"	100	20	"

## SIMPLE DIVISION.

6	in	6	1	time
6	"	12	2	"
6	"	18	3	"
6	"	24	4	"
6	"	30	5	"
6	"	36	6	"
6	"	42	7	"
6	"	48	8	"
6	"	54	9	"
6	"	60	10	"
6	"	66	11	"
6	"	72	12	"
6	"	78	13	"
6	"	84	14	"
6	"	90	15	"
6	"	96	16	"
6	"	102	17	"
6	"	108	18	"
6	"	114	19	"
6	"	120	20	"

8	in	8	1	time
8	"	16	2	"
8	"	24	3	"
8	"	32	4	"
8	"	40	5	"
8	"	48	6	"
8	"	56	7	"
8	"	64	8	"
8	"	72	9	"
8	"	80	10	"
8	"	88	11	"
8	"	96	12	"
8	"	104	13	"
8	"	112	14	"
8	"	120	15	"
8	"	128	16	"
8	"	136	17	"
8	"	144	18	"
8	"	152	19	"
8	"	160	20	"

7	in	7	1	time
7	"	14	2	"
7	"	21	3	"
7	"	28	4	"
7	"	35	5	"
7	"	42	6	"
7	"	49	7	"
7	"	56	8	"
7	"	63	9	"
7	"	70	10	"
7	"	77	11	"
7	"	84	12	"
7	"	91	13	"
7	"	98	14	"
7	"	105	15	"
7	"	112	16	"
7	"	119	17	"
7	"	126	18	"
7	"	133	19	"
7	"	140	20	"

9	in	9	1	time
9	"	18	2	"
9	"	27	3	"
9	"	36	4	"
9	"	45	5	"
9	"	54	6	"
9	"	63	7	"
9	"	72	8	"
9	"	81	9	"
9	"	90	10	"
9	"	99	11	"
9	"	108	12	"
9	"	117	13	"
9	"	126	14	"
9	"	135	15	"
9	"	144	16	"
9	"	153	17	"
9	"	162	18	"
9	"	171	19	"
9	"	180	20	"

10	in	10	1	time	11	in	11	1	time
10	"	20	2	"	11	"	22	2	"
10	"	30	3	"	11	"	33	3	"
10	"	40	4	"	11	"	44	4	"
10	"	50	5	"	11	"	55	5	"
10	"	60	6	"	11	"	66	6	"
10	"	70	7	"	11	"	77	7	"
10	"	80	8	"	11	"	88	8	"
10	"	90	9	"	11	"	99	9	"
10	"	100	10	"	11	"	110	10	"
10	"	110	11	"	11	"	121	11	"
10	"	120	12	"	11	"	132	12	"
10	"	130	13	"	11	"	143	13	"
10	"	140	14	"	11	"	154	14	"
10	"	150	15	"	11	"	165	15	"
10	"	160	16	"	11	"	176	16	"
10	"	170	17	"	11	"	187	17	"
10	"	180	18	"	11	"	198	18	"
10	"	190	19	"	11	"	209	19	"
10	"	200	20	"	11	"	220	20	"
12	in	12	1	time	13	in	13	1	time
12	"	24	2	"	13	"	26	2	"
12	"	36	3	"	13	"	39	3	"
12	"	48	4	"	13	"	52	4	"
12	"	60	5	"	13	"	65	5	"
12	"	72	6	"	13	"	78	6	"
12	"	84	7	"	13	"	91	7	"
12	"	96	8	"	13	"	104	8	"
12	"	108	9	"	13	"	117	9	"
12	"	120	10	"	13	"	130	10	"
12	"	132	11	"	13	"	143	11	"
12	"	144	12	"	13	"	156	12	"
12	"	156	13	"	13	"	169	13	"
12	"	168	14	"	13	"	182	14	"
12	"	180	15	"	13	"	195	15	"
12	"	192	16	"	13	"	208	16	"
12	"	204	17	"	13	"	221	17	"
12	"	216	18	"	13	"	234	18	"
12	"	228	19	"	13	"	247	19	"
12	"	240	20	"	13	"	260	20	"

14	in	14	1	time	15	in	15	1	time
14	"	28	2	"	15	"	30	2	"
14	"	42	3	"	15	"	45	3	"
14	"	56	4	"	15	"	60	4	"
14	"	70	5	"	15	"	75	5	"
14	"	84	6	"	15	"	90	6	"
14	"	98	7	"	15	"	105	7	"
14	"	112	8	"	15	"	120	8	"
14	"	126	9	"	15	"	135	9	"
14	"	140	10	"	15	"	150	10	"
14	"	154	11	"	15	"	165	11	"
14	"	168	12	"	15	"	180	12	"
14	"	182	13	"	15	"	195	13	"
14	"	196	14	"	15	"	210	14	"
14	"	210	15	"	15	"	225	15	"
14	"	224	16	"	15	"	240	16	"
14	"	238	17	"	15	"	255	17	"
14	"	252	18	"	15	"	270	18	"
14	"	266	19	"	15	"	285	19	"
14	"	280	20	"	15	"	300	20	"

16	in	16	1	time	17	in	17	1	time
16	"	32	2	"	17	"	34	2	"
16	"	48	3	"	17	"	51	3	"
16	"	64	4	"	17	"	68	4	"
16	"	80	5	"	17	"	85	5	"
16	"	96	6	"	17	"	102	6	"
16	"	112	7	"	17	"	119	7	"
16	"	128	8	"	17	"	136	8	"
16	"	144	9	"	17	"	153	9	"
16	"	160	10	"	17	"	170	10	"
16	"	176	11	"	17	"	187	11	"
16	"	192	12	"	17	"	204	12	"
16	"	208	13	"	17	"	221	13	"
16	"	224	14	"	17	"	238	14	"
16	"	240	15	"	17	"	255	15	"
16	"	256	16	"	17	"	272	16	"
16	"	272	17	"	17	"	289	17	"
16	"	288	18	"	17	"	306	18	"
16	"	304	19	"	17	"	323	19	"
16	"	320	20	"	17	"	340	20	"

18	in	18	1	time
18	"	36	2	"
18	"	54	3	"
18	"	72	4	"
18	"	90	5	"
18	"	108	6	"
18	"	126	7	"
18	"	144	8	"
18	"	162	9	"
18	"	180	10	"
18	"	198	11	"
18	"	216	12	"
18	"	234	13	"
18	"	252	14	"
18	"	270	15	"
18	"	288	16	"
18	"	306	17	"
18	"	324	18	"
18	"	342	19	"
18	"	360	20	"

19	in	19	1	time
19	"	38	2	"
19	"	57	3	"
19	"	76	4	"
19	"	95	5	"
19	"	114	6	"
19	"	133	7	"
19	"	152	8	"
19	"	171	9	"
19	"	190	10	"
19	"	209	11	"
19	"	228	12	"
19	"	247	13	"
19	"	266	14	"
19	"	285	15	"
19	"	304	16	"
19	"	323	17	"
19	"	342	18	"
19	"	361	19	"
19	"	380	20	"

20	in	20	1	time
20	"	40	2	"
20	"	60	3	"
20	"	80	4	"
20	"	100	5	"
20	"	120	6	"
20	"	140	7	"
20	"	160	8	"
20	"	180	9	"
20	"	200	10	"

20	in	220	11	time
20	"	240	12	"
20	"	260	13	"
20	"	280	14	"
20	"	300	15	"
20	"	320	16	"
20	"	340	17	"
20	"	360	18	"
20	"	380	19	"
20	"	400	20	"

## EXAMPLES.

(1.)

4)568743864

142185966

(3.)

9)9763856

1084872—8

(2.)

6)6894868

1149144—4 rem.

(4.)

12)8764864

730405—4

(5.)

$$\begin{array}{r}
 4)87643(21910 \\
 8 \quad \quad \quad 4 \\
 \hline
 7 \quad \quad \quad 87643 \text{ proof.} \\
 4 \\
 \hline
 36 \\
 36 \\
 \hline
 4 \\
 4 \\
 \hline
 3
 \end{array}$$

(6.)

$$\begin{array}{r}
 8)97643(12205 \\
 8 \\
 \hline
 17 \\
 16 \\
 \hline
 16 \\
 16 \\
 \hline
 43 \\
 40 \\
 \hline
 3 \text{ remainder.}
 \end{array}$$

(7.)

$$\begin{array}{r}
 14)6898(492 \\
 56 \\
 \hline
 129 \\
 126 \\
 \hline
 38 \\
 28 \\
 \hline
 10
 \end{array}$$

(8.)

$$\begin{array}{r}
 36)87436(2428 \\
 72 \\
 \hline
 154 \\
 144 \\
 \hline
 103 \\
 72 \\
 \hline
 316 \\
 288 \\
 \hline
 28
 \end{array}$$

(9.)

$$\begin{array}{r}
 40)7364(184 \\
 40 \\
 \hline
 336 \\
 320 \\
 \hline
 164 \\
 160 \\
 \hline
 4
 \end{array}$$

(10.)

$$\begin{array}{r}
 360)978964(2302 \\
 720 \\
 \hline
 2589 \\
 2580 \\
 \hline
 964 \\
 720 \\
 \hline
 244
 \end{array}$$

(11.)	(12.)
3956)34585539543(8742552	6,00)74389486,00(12398247
31648	6
————	————
29375	14
27692	12
————	————
16833	23
15824	18
————	————
10099	58
7912	54
————	————
21875	49
19780	48
————	————
20954	14
19780	12
————	————
11743	28
7912	24
————	————
3831	46
	42
	————
	4

13. If the sum of 262,200 dollars were equally divided among 345 men, how many dollars would each receive ?

*Ans. \$760.*

14. If 383,040 dollars were equally divided among 456 men, how much would each receive ? *Ans. \$840.*

15. Sold 345 bushels of wheat for 2415 dollars ; what is it per bushel ? *Ans. \$7.*

16. Sold a farm, containing 365 acres of land, for 8395 dollars ; how much was it per acre ? *Ans. \$23.*

17. If a prize, worth 36,900 dollars, be equally divided among 450, how much would each man receive ?

*Ans. \$82.*

18. Bought a piece of cloth for 363 dollars, at 3 dollars per yard ; how many yards in the said piece of cloth ?

*Ans. 121.*

19. A man having 5520 bushels of corn, wishes to put it into bins, each holding 16 bushels; how many bins will it take?

*Ans. 345 bins.*

20. A regiment of soldiers, consisting of 500 men, are allowed 1000 pounds of pork per day; how much is each man's part?

*Ans. 2 lbs.*

21. Write down 4617, multiply it by 12, divide the product by 9, and add 365 to the quotient, then from that sum subtract 5521, and the remainder will be just one thousand. Try it and see.

#### TABLE OF MONEY, WEIGHTS, MEASURES, &c.

##### 1. *Federal Money.*

10 mills (m.) make	1 cent, marked	c.
10 cents,	1 dime,	d.
10 dimes,	1 dollar,	\$.
10 dollars,	1 eagle,	E.

##### 2. *Sterling Money.*

4 farthings make	1 penny,	d.
12 pence,	1 shilling,	s.
20 shillings,	1 pound,	£.

##### 3. *Troy Weight.*

24 grains (gr.) make	1 pennyweight, marked	dwt.
20 pennyweights,	1 ounce,	oz.
12 ounces,	1 pound,	lb.

##### 4. *Avoirdupois Weight.*

16 drams (dr.) make	1 ounce,	oz.
16 ounces,	1 pound,	lb.
28 pounds, 1 quarter of a hundred weight,		qr.
4 quarters,	1 hundred weight,	cwt.
20 hundred weight,	1 ton.	T.

By this weight are weighed all coarse and drossy goods, grocery wares, and all metals except gold and silver.

##### 5. *Apothecaries Weight.*

20 grains (gr.) make	1 scruple,	ʒ
3 scruples,	1 dram,	ʒ
8 drams,	1 ounce,	ʒ
12 ounces,	1 pound,	lb.

Apothecaries use this weight in compounding their medicines.

## 6. Cloth Measure.

4 nails ( <i>na.</i> ) make	1 quarter of a yard,	qr.
4 quarters,	1 yard,	yd.
3 quarters,	1 Ell Flemish,	<i>E. Fl.</i>
5 quarters,	1 Ell English,	<i>E. E.</i>
6 quarters,	1 Ell French,	<i>E. Fr.</i>

## 7. Dry Measure.

2 pints, ( <i>pt.</i> ) make	1 quart,	qt.
8 quarts,	1 peck,	<i>pk.</i>
4 pecks,	1 bushel,	<i>bu.</i>

This measure is applied to grain, beans, flax-seed, salt, oats, oysters, coal, &c.

## 8. Wine Measure.

4 gills ( <i>gi.</i> ) make	1 pint,	pt.
2 pints,	1 quart,	qt.
4 quarts,	1 gallon,	<i>gal.</i>
31½ gallons,	1 barrel,	<i>bl.</i>
42 gallons,	1 tierce,	<i>tier.</i>
63 gallons,	1 hogshead,	<i>hhd.</i>
2 hogsheads,	1 pipe,	<i>p.</i>
2 pipes,	1 tun,	<i>T.</i>

All brandies, spirits, mead, vinegar, oil, &c., are measured by wine measure. *Note.* 231 solid inches make a gallon.

## 9. Long Measure.

3 barleycorns ( <i>b. c.</i> ) make	1 inch, marked	in.
12 inches,	1 foot,	<i>ft.</i>
3 feet,	1 yard,	<i>yd.</i>
5½ yards,	1 rod, pole, or perch.	<i>rd.</i>
40 rods,	1 furlong,	<i>fur.</i>
8 furlongs,	1 mile,	<i>m.</i>
3 miles,	1 league,	<i>lea.</i>
69½ statute miles,	1 degree, on the earth.	
360 degrees, the circumference of the earth.		

The use of long measure is to measure the distance of places, or any other thing where length is considered without regard to breadth.

N. B. In measuring the height of horses, 4 inches make 1 hand. In measuring depths, 6 feet make 1 fathom or French.

toise. Distances are measured by a chain, four rods long, containing one hundred links.

10. *Land, or Square Measure.*

144 square inches make	1 square foot.
9 square feet,	1 square yard.
30 $\frac{1}{2}$ square yards, or }	1 square rod.
272 $\frac{1}{4}$ square feet,	
40 square rods,	1 square rood.
4 square roods,	1 square acre.
640 square acres,	1 square mile.

11. *Solid, or Cubic Measure.*

1728 solid inches make	1 solid foot.
40 feet of round timber, or }	
50 feet of hewn timber, }	1 ton or load.

128 solid feet, or 8 feet long, }	
4 wide, and 4 high, }	1 cord of wood.

All solids, or things that have length, breadth, and depth, are measured by this measure. N. B. The wine gallon contains 231 solid or cubic inches, and the beer gallon 282. A bushel contains 2150,42 solid inches.

12. *Time.*

60 seconds (S.) make	1 minute, marked	<i>M.</i>
60 minutes,	1 hour,	<i>h.</i>
24 hours,	1 day,	<i>d.</i>
7 days,	1 week,	<i>w.</i>
4 weeks,	1 month,	<i>mo.</i>
13 months, 1 day and 6 hours, 1 Julian year,		<i>yr.</i>

Thirty days hath September, April, June, and November; February twenty-eight alone, all the rest have thirty-one.

N. B. In Bissextile, or leap year, February hath 29 days.

13. *Circular Motion.*

60 seconds (") make	1 minute,	
60 minutes,	1 degree,	
30 degrees,	1 sign,	<i>S.</i>
12 signs, or 360 degrees, the whole great circle of the		
Zodiac.		

## COMPOUND ADDITION

TEACHETH to collect numbers of different denominations into one total.

*Rule.* Arrange the numbers so that those of the same denomination may stand directly under each other, and draw a line under them.

Add the numbers in the lowest denomination together, and find how many units of the next higher denomination are contained in their sum.

Write down the remainder, and carry the units to the next higher denomination, and proceed thus to the end.

## EXAMPLES.

## FEDERAL MONEY.

(1.)

\$	cts.	m.
174	74	3
186	67	5
226	89	8
164	40	9
<hr/>		
752	72	5
<hr/>		

(2.)

\$	cts.	m.
396	54	3
876	58	6
786	56	2
375	59	8
967	50	6
987	37	4
469	25	8
357	37	5
222	22	2
364	67	4
<hr/>		

## STERLING MONEY.

(3.)

£	s.	d.	qr.
48	13	6	2
96	15	9	3
27	18	10	2
33	9	8	3
86	2	7	3
48	5	6	3
<hr/>			

(4.)

£	s.	d.
475	18	6
337	16	9
200	15	3
496	7	7
462	7	10
934	9	7
333	3	3
<hr/>		

## TROY WEIGHT.

(5.)				(6.)			
lb.	oz.	dwt.	gr.	lb.	oz.	dwt.	gr.
48	7	14	17	99	11	19	23
36	11	18	23	107	5	8	22
84	10	17	20	209	9	17	21
68	4	13	13	200	8	16	20
37	7	17	17	300	7	15	19
96	8	16	18	666	6	16	16

## AVOIRDUPOIS WEIGHT.

(7.)				(8.)				
T.	cwt.	qr.	lb.	oz.	dr.	cwt.	qr.	lb.
350	14	2	19	14	13	60	2	26
680	19	3	26	13	9	45	3	18
356	18	1	27	15	15	33	3	3
220	12	2	20	14	14	44	2	18
386	17	3	13	13	13	67	3	14
376	14	2	18	15	13	58	1	16

## APOTHECARIES WEIGHT.

(9.)				(10.)					
lb.	oz.	dr.	sc.	gr.	lb.	oz.	dr.	sc.	gr.
6	6	7	2	16	25	11	7	2	19
9	9	6	1	18	60	10	6	1	18
60	10	7	2	13	64	8	4	2	16
44	3	3	1	17	80	7	3	1	15
60	8	6	1	14	35	6	2	2	14

## CLOTH MEASURE.

(11.)			(12.)		
yd.	qr.	na.	E.Fr.	qr.	na.
687	3	3	475	2	3
486	3	2	600	3	2
386	2	3	800	3	1
489	2	1	68	1	1
643	3	3	968	2	2

## WINE MEASURE.

(13.)			
tun	hhd.	gal.	qt.
pt.			
500	1	60	3
			1
674	3	56	2
			1
387	2	61	3
			1
837	2	44	2
			1
444	3	25	3
			1

(14.)			
hhd.	gal.	qt.	pt.
75	45	3	
44	61	2	
37	43	3	
99	60	2	
77	40	0	

## ALE AND BEER MEASURE.

(15.)			
hhd.	gal.	qt.	pt.
55	55	3	1
38	44	2	0
48	36	2	0
36	47	1	1
60	60	3	1
38	44	2	1

(16.)			
hhd.	gal.	qt.	pt.
80	47	3	2
63	39	2	0
42	24	3	1
69	29	2	1
75	48	3	1
87	36	1	0

## DRY MEASURE.

(17.)			
qr.	bu.	pk.	qt.
43	7	3	7
63	6	2	6
43	5	1	5
87	5	2	5
60	3	1	3
44	6	2	4

(18.)			
chal.	bu.	pk.	qt.
675	31	2	3
743	29	2	7
647	26	3	6
434	28	0	4
386	34	1	3
487	22	2	6

## LONG MEASURE.

## (19.)

deg.	mil.	fur.	po.	ft.	in.	b.c.
560	56	7	30	15	9	2
374	50	6	26	14	8	2
246	46	5	24	13	9	0
222	37	4	33	12	4	2
460	28	3	28	11	6	1

## COMPOUND ADDITION.

## LAND MEASURE.

(20.)	(21.)
acr. roo. pr.	acr. roo. pr.
645 3 29	860 3 21
742 2 28	643 2 20
468 3 27	375 1 16
375 2 29	479 3 12
269 1 20	786 2 10
377 3 14	111 1 11

## TIME.

years.	days.	hours.	min.	sec.
365	250	23	59	58
487	241	21	40	47
683	264	20	56	51
387	146	19	37	44
486	153	16	43	29
764	234	18	49	48

23. Find the amount of the following sums : £46 14s 8d, £96 18s 6d, £47 18s 9d, £37 19s 10d, and £13 12s 4d.

*Ans.* £243 4s 1d.

24. In a contribution, A put in £7 14s 6d ; B put in £1 8s 9d ; C put in 12s 8d ; D put in 6d 2qrs ; E put in 17s ; and F 12s 4d: how much did they all pay ?

*Ans.* £11 5s 9d 2qrs.

25. If 7 men should each of them pay a sum of £14 7s 8d 2qrs, how much would they all pay ? *Ans.* £100 13s 11d 2qrs.

26. A man had three sons: John was 6 years 4 months old ; George was 8 years 6 months and 12 days old ; James was 18 years old. What was the age of all of them ?

*Ans.* 32 yrs. 10 mo. 12 days.

27. Bought a quantity of goods at New York to the amount of £384 17s 8d ; paid for carting to the dock, 12s 8d ; paid for freighting the same to Albany, £2 17s 8d ; then paid for carting the same to Geneva, £7 1s 10d ; and my own expenses were £6 14s 9d ; how much do the goods stand me in at Geneva ? *Ans.* £402 4s 7d.

28. If A should pay 15s 8d ; B pay twice as much ; C pay twice as much as B ; D pay 7s 6d ; and E pay as much all the others ; how much money would they all pay ?

*Ans. £11 14s 4d.*

29. If I have a silver tankard that weighs 3 pounds 7 ounces 16 pennyweights and 4 grains, and a dozen silver table-spoons, weighing 1 pound and 12 grains, a sugar bowl that weighs 9 ounces and 10 pennyweights, and six tea-spoons weighing 17 pennyweights each ; how heavy do they all weigh ?

*Ans. 5 lbs. 10 oz. 8 dwt. 16 grs.*

30. Suppose I have five barrels of potash, whose weight is as follows : the first weighs 3 cwt. 1 qr. and 12 lbs. : the second, 2 cwt. 3 qrs. and 26 lbs. ; the third, 3 cwt. 3 qrs. and 6 lbs. ; the fourth, 3 cwt. and 17 lbs. ; the fifth, not being well packed, would not weigh more than 2 cwt. 24 lbs. : what is the weight of the whole ?

*Ans. 15 cwt. 2 qrs. 1 lb.*

### COMPOUND SUBTRACTION

TEACHETH to find the inequality between numbers of divers denominations.

*Rule.* Having arranged the numbers so that the smaller may stand under the greater, subtract each number in the lower line from that which stands above it, and write down the remainders. When any of the lower denominations are greater than the upper, increase the upper number by as many as make one of the next higher denomination, from which take the figure in the lower line, and set down the remainder, carry one to the next number in the lower line, and subtract as before.

#### EXAMPLES.

#### FEDERAL MONEY.

(1.)

\$.	cts.	m.
687	45	6
376	37	4

(2.)

\$	cts.	m.
99	48	9
86	56	7

#### STERLING MONEY.

(3.)

£	s.	d.	qr.
100	18	10	3
60	14	6	1

(4.)

£	s.	d.	qr.
4	6	4	2
3	9	9	3

## TROY WEIGHT.

(5.)				(6.)			
lb.	oz.	dwt.	gr.	lb.	oz.	dwt.	gr.
47	10	2	16	100	9	15	16
8	9	8	6	99	7	18	7
<hr/>				<hr/>			

## AVOIRDUPOIS WEIGHT.

(7.)				(8.)			
ton	cwt.	qr.	lb.	oz.	dr.	cwt.	qr.
70	8	3	24	4	12	95	3
62	16	2	26	15	7	54	2
<hr/>				<hr/>			

## APOTHECARIES WEIGHT.

(9.)				(10.)			
lb.	oz.	dr.	sc.	lb.	oz.	dr.	sc.
67	8	6	2	16	9	6	5
43	7	7	2	9	4	3	3
<hr/>				<hr/>			

## CLOTH MEASURE.

(11.)			(12.)			(13.)		
yd.	qr.	na.	E.Fl.	qr.	na.	E.E.	qr.	na.
65	3	8	189	1	3	60	3	3
48	2	3	160	2	2	43	2	2
<hr/>			<hr/>			<hr/>		

## WINE MEASURE.

(14.)					(15.)				
tun	hhd.	gal.	qt.	pt.	hhd.	gal.	qt.	pt.	
996	3	3	4	3	1	77	62	3	1
645	2	60	2	1	69	24	2	0	
<hr/>					<hr/>				

## ALE AND BEER MEASURE.

(16.)				(17.)			
hhd.	gal.	qt.	pt.	hhd.	gal.	qt.	pt.
89	46	2	1	675	60	2	1
67	55	3	1	536	50	3	0
<hr/>				<hr/>			

## DRY MEASURE.

(18.)				
gr.	bu.	gal.	qt.	
38	4	3	3	
36	5	5	2	
<hr/>				

(19.)				
chal.	bu.	gal.	qt.	
637	31	4	2	
387	35	5	2	
<hr/>				

## LONG MEASURE.

(20.)				
deg.	m.	fur.	p.	ft.
867	63	6	27	8
867	63	6	27	8
<hr/>				

(21.)				
m.	fur.	p.	ft.	
49	6	13	11	
37	7	15	8	
<hr/>				

## LAND MEASURE.

(22.)			
acr.	roo.	per.	
675	2	11	
484	3	15	
<hr/>			

(23.)			
acr.	roo.	per.	
75	1	3	
69	3	8	
<hr/>			

## TIME.

(24.)				
yrs.	da.	hr.	m.	sec.
437	116	18	44	36
311	100	9	59	45
<hr/>				

(25.)				
yrs.	da.	hr.	m.	sec.
67	360	21	50	50
18	364	23	46	56
<hr/>				

## SOLID, OR CUBIC MEASURE.

(26.)		
cord	ft.	in.
60	87	96
45	118	136
<hr/>		

(27.)		
ton	ft.	in.
37	24	1712
24	37	184
<hr/>		

28. Borrowed £50 10s : paid again at one time £17 11s 6d ; and at another time £9 4s 8d ; at another time £17 9s 6d ; and at another time 19s 6d 2 qrs. How much remains unpaid ?

*Ans. £15 4s 9d 2 qrs.*

29. Borrowed £100, and paid in part as follows, viz., at one time £21 11s 6d; at another time £19 17s 4d 2 qrs; at another time 10 dollars, at 6 shillings each; and at another time 2 English guineas, at 28 shillings each, and 2 pistareens, at 14d 2-qrs each; how much remains due, or unpaid?

*Ans. £52 12s 8d 2 qrs.*

30. A, B, and C, drew their prize-money as follows, viz., A had £75 15s 4d; B had three times as much as A lacking 15s 6d; and C had as much as A and B both; how much had C?

*Ans. £302 5s 10d.*

31. I lent John Paywell 1000 dollars, and afterward lent him 26 dollars and 45 cents more. He has paid me at one time 361 dollars 40 cents, and at another time 416 dollars 9 cents, besides a note which he gave me on Peter Trusty for 143 dollars 90 cents; how stands the balance between us?

*Ans. \$105,06 cts. my due.*

32. Paid A B in full for E F's bill on me for £105 10s, viz.; I gave him Paul Jones' note for £15 14s 9d; John Cook's note for £30 0s 6d; an order on Sam Patch for £39 11s; the rest I make up in cash. I wish to know what sum will make up the deficiency?

*Ans. £20 3s 9d.*

### COMPOUND MULTIPLICATION

Is the multiplying of numbers of different denominations by a simple figure or figures, whose product shall be equal to a proposed number or numbers.

*Rule.* Write the multiplier under the lowest denomination of the multiplicand; multiply every number of the multiplicand by the multiplier, and bring the several products as they occur to the next higher denomination; write down the remainders, and carry the integers to the next product.

#### EXAMPLES.

##### STERLING MONEY.

(1.)		
£	s.	d.
36	14	8
2		

---

(2.)		
£	s.	d.
24	16	7
3		

---

(3.)			
£	s.	d.	qr.
675	4	6	2
			8
<hr/>			

(4.)			
£	s.	d.	qr.
76	8	3	3
			12
<hr/>			

## TROY WEIGHT.

(5.)			
lb.	oz.	dwt.	gr.
76	10	14	23
			9
<hr/>			

(6.)			
lb.	oz.	dwt.	gr.
4	6	8	4
			11
<hr/>			

## AVOIRDUPOIS WEIGHT.

(7.)			
ton	cwt.	qr.	lb.
647	7	1	16
			10
			12
			5
<hr/>			

(8.)			
lb.	oz.	dr.	lb.
96	11	12	
			6
<hr/>			

## APOTHECARIES WEIGHT.

(9.)			
lb.	oz.	dr.	sc.
44	4	4	2
			16
			7
<hr/>			

(10.)			
lb.	oz.	dr.	sc.
16	8	3	1
			14
			12
<hr/>			

## CLOTH MEASURE.

(11.)		
yd.	qr.	na.
8	3	1
		4
<hr/>		

(12.)		
E.E.	qr.	na.
64	2	2
		6
<hr/>		

(13.)		
E.Fr.	qr.	na.
18	1	1
		8
<hr/>		

## WINE MEASURE.

(14.)				
tun	hhd.	gal.	qt.	pt.
3764	1	60	3	1
			11	
<hr/>				

(15.)				
hhd.	gal.	qt.	pt.	
900	45	1	1	
			10	
<hr/>				

## ALE AND BEER MEASURE.

(16.)			
hhd.	gal.	qt.	pt.
15	18	3	1
			16
<hr/>			
<hr/>			

(17.)			
hhd.	gal.	qt.	pt.
227	40	3	0
			14
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## DRY MEASURE.

(18.)			
qt.	bu.	gal.	qt.
47	5	3	2
			18
<hr/>			
<hr/>			

(19.)			
chal.	bu.	gal.	qt.
88	31	4	1
			6
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## LONG MEASURE.

(20.)			
deg.	m.	fur.	p.
64	49	4	27
			16
			11
			1
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<hr/>			

(21.)			
m.	fur.	p.	ft.
69	4	15	12
			20
<hr/>			
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## LAND MEASURE.

(22.)			
acr.	roo.	per.	
1000	3	14	
			14
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<hr/>			

(23.)			
acr.	roo.	per.	
70	1	2	
			15
<hr/>			
<hr/>			

(24.)			
acr.	roo.	per.	
55	2	8	
			16
<hr/>			
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## SOLID, OR CUBIC MEASURE.

(25.)			
cord.	ft.	in.	
379	114	8	
			70
<hr/>			
<hr/>			

(26.)			
ton.	ft.	in.	
666	83	1726	
			60
<hr/>			
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## TIME.

(27.)					
yr.	da.	hr.	m.	sec.	
63	118	11	40	61	
				35	
<hr/>					
<hr/>					

(28.)					
yr.	da.	hr.	m.	sec.	
91	361	5	5	15	
					86
<hr/>					
<hr/>					

NOTE. When the multiplier is a composit number, and greater than 12, take any two such numbers as, when multiplied together, will exactly produce the given quantity, and multiply first by one of those figures, and that product by the other, and the last product will be the answer. When no two numbers, multiplied together, will exactly make the multiplier, you may multiply by any two whose product will come the nearest; then multiply the upper line by what remained; which, added to the last product, gives the answer.

## BILL OF PARCELS.

Boston, June 15th, 1839.

Mr. Peter Dow,

Bought of Geo. Smith &amp; Co.

8 pairs worsted hose,	at 4s 6d,	\$6 00
5 do. thread do.	" 3s 2d,	2 64
3 yds. kerseymere,	" 14s,	7 00
6 do. muslin,	" 4s 2d,	4 16
2 do. tammy,	" 1s 8d,	0 56
4 shawls,	" 7s 6d,	5 00
64½ yds. nankins,	" 2s,	21 50
32 ells mode,	" 3s,	16 00
28½ yds. calico,	" 2s 4d,	11 08
2 gross gilt coat-buttons,	" 18s 6d,	6 17
3 pieces russel,	" 34s,	17 00
2 do. muslin,	" 30s,	10 00
25 yds. Irish linen,	" 2s,	8 33
28½ do. stormount calico,	" 2s 6d,	11 88
28½ do. red do.	" 2s 2d;	10 29
1 piece durant,	" 56s,	9 33
2 pieces blue shalloon,	" 57s 6d,	19 17
50½ yds. dimity,	" 2s 6d,	21 04
3 pieces persian,	" 84s,	42 00
Amount at 6s to the dollar,		\$229 15
8s	- -	171 86
7s 6d	-	183 32
4s 8d	- -	294 62

29. What is the weight of 7 hhds. of sugar, each weighing 9 cwt. 3 qrs. 12 lbs. ? *Ans. 69 cwt.*

30. What is the weight of 6 chests of tea, each weighing 3 cwt. 2 qrs. 9 lbs. ? *Ans. 21 cwt. 1 qr. 26 lbs.*

31. How much brandy in 9 casks, each containing 41 gals.  
3 qts. 1 pt. ? *Ans. 376 gals. 3 qts. 1 pt.*

32. In 35 pieces of cloth, each measuring 27 yds. 3 qrs.,  
how many yards ? *Ans. 971 yds. 1 gr.*

33. In 9 fields, each containing 14 acres 1 rood and 25 pr.,  
how many acres ? *Ans. 129 acrs. 2 roo. 25 pr.*

34. In 6 parcels of wood, each containing 5 cords and 96  
feet, how many cords ? *Ans. 34 cords 64 feet.*

35. A gentleman having 18 silver spoons, each weighing  
2 oz. 15 dwt. 11 grs.; also 24 tea-spoons, each weighing 10  
dwt. 14 grs.; and 2 silver tankards, each weighing 21 oz. 15  
dwt. Pray, what is the weight of the whole ?  
*Ans. 8 lbs. 10 oz. 2 dwt. 6 grs.*

## COMPOUND DIVISION

TEACHETH to find how often one number is contained in another of different denomination.

*Rule.* Begin at the left hand, and divide each denomination by the divisor, setting down the quotients under their respective dividends. But if there be a remainder after dividing any of the denominations except the least, find how many of the next lower denomination it is equal to, and add it to the number, if any, which was in this denomination before, then divide the sum as usual, and so on, till the whole is finished.

The method of proof is the same as in Simple Division.

## STERLING MONEY.

(1.)				(2.)			
<i>£</i>	<i>s.</i>	<i>d.</i>		<i>£</i>	<i>s.</i>	<i>d.</i>	<i>gr.</i>
2)64	18	6		3)375	13	7	2
32	9	3		125	4	6	2

## TROY WEIGHT.

(3.)				(4.)			
<i>lb.</i>	<i>oz.</i>	<i>dwt.</i>	<i>gr.</i>	<i>lb.</i>	<i>oz.</i>	<i>dwt.</i>	<i>gr.</i>
8)44	8	12	4	7)75	3	16	19

## AVOIRDUPOIS WEIGHT.

(5.)						(6.)		
ton	cwt.	qr.	lb.	oz.	dr.	lb.	oz.	dr.
9)48	16	1	14	13	12	11)14	3	3

## APOTHECARIES WEIGHT.

(7.)						(8.)			
lb.	oz.	dr.	sc.	gr.	lb.	oz.	dr.	sc.	gr.
12)337	4	5	1	14	4)37	1	1	1	4

## CLOTH MEASURE.

(9.)			(10.)			(11.)		
yd.	qr.	na.	E.E.	qr.	na.	E.Fl.	qr.	na.
6)74	2	3	7)88	1	1	8)77	2	1

## WINE MEASURE.

(12.)					(13.)			
tun	hhd.	gal.	qt.	pt.	hhd.	gal.	qt.	
10)99	2	56	3	1	9)777	44	1	

## ALE AND BEER MEASURE.

(14.)					(15.)			
hhd.	gal.	qt.	pt.		hhd.	gal.	qt.	pt.
11)83	53	1	0		6)911	45	3	1

## DRY MEASURE.

(16.)				(17.)			
bu.	gal.	qt.		chal.	bu.	gal.	qt.
7)34	5	3		9)643	33	4	3

## LONG MEASURE.

(18.)						(19.)			m.	fur.
deg.	m.	fur.	p.	ft.	in.	b.	c.	m.	fur.	r.
3)47	49	6	27	8	10	2		7)37	4	30

## COMPOUND DIVISION.

## LAND MEASURE.

$$(20.) \quad \begin{array}{r} acr. \ roo. \ r. \\ 12)46 \ 2 \ 18 \\ \hline \end{array}$$

$$(21.) \quad \begin{array}{r} acr. \ roo. \ per. \\ 12)974 \ 1 \ 37 \\ \hline \end{array}$$

## SOLID, OR CUBIC MEASURE.

$$(22.) \quad \begin{array}{r} ton \ ft. \ in. \\ 11)91 \ 39 \ 144 \\ \hline \end{array}$$

$$(23.) \quad \begin{array}{r} ton \ ft. \ in. \\ 11)684 \ 17 \ 1727 \\ \hline \end{array}$$

## TIME.

$$(24.) \quad \begin{array}{r} yr. \ da. \ hr. \ m. \ sec. \\ 12)365 \ 113 \ 11 \ 39 \ 49 \\ \hline \end{array}$$

$$(25.) \quad \begin{array}{r} yr. \ da. \ hr. \ m. \\ 9)4 \ 1 \ 1 \ 1 \\ \hline \end{array}$$

NOTE. When the divisor is large, and not a composite number, you may divide by the whole divisor at once, after the manner of long division, thus :

$$(26.) \quad \begin{array}{r} \pounds \ s. \ d. \\ 37)46 \ 1 \ 11(\pounds 1 \\ 37 \\ \hline 9 \\ 20 \\ \hline 37)181(4s \\ 148 \\ \hline 33 \\ 12 \\ \hline 37)407(11d \\ 407 \\ \hline \end{array}$$

Ans.  $\pounds 1$  4s 11d.

$$(27.)$$

$$\begin{array}{r} lb. \quad oz. \quad dwt. \\ 24) 26 \quad 1 \quad 5(1lb. \\ \hline 24 \end{array}$$

$$\begin{array}{r} 2 \\ 12 \\ \hline 24) 25(1oz. \\ \hline 24 \end{array}$$

$$\begin{array}{r} 1 \\ 20 \\ \hline 24) 25(1dwt. \\ \hline 24 \end{array}$$

$$24) 24(1gr. \quad Ans. 1lb. 1oz. 1dwt. 1gr.$$

28. Divide 4 gallons and 2 quarts of brandy equally among 144 soldiers. *Ans. 1 gill a piece.*

29. Bought 12 silver spoons, which together weighed 3 lb. 2 oz. 13 dwt. 12 gr., how much silver did each spoon contain? *Ans. 3 oz. 4 dwt. 11 grs.*

30. Bought 17 cwt. 3 qrs. 19 lbs. of sugar, and sold out one-third of it; how much remains unsold?

*Ans. 11 cwt. 3 qr. 22 lbs.*

31. From a piece of cloth containing 64 yards 2 nails, a tailor was ordered to make 9 soldiers' coats, which took one-third of the whole piece; how many yards did each coat contain? *Ans. 2 yds. 1 qr. 2 na.*

32. If a man spends £74 14s 6d a year, what is that per calendar month? *Ans. £5 19s 6½d.*

33. The Prince of Wales' salary is £150,000 a year; what is that per day? *Ans. £410 19s 2d.*

34. A privateer takes a prize worth 12,465 dollars, of which the owner takes one-half, the officers one-fourth, and the remainder is equally divided among the sailors, who are 125 in number; how much is each sailor's part?

*Ans. \$24,93 cts.*

## DECIMAL FRACTIONS.

A DECIMAL FRACTION is that whose denominator is an unit, with as many ciphers annexed to it as the numerator has places, and is usually expressed by writing the numerator only, with a point before it, called the separatrix; thus,  $\frac{5}{10}$ ,  $\frac{25}{100}$ ,  $\frac{125}{1000}$  are decimal fractions, and are expressed by .5, .25, .125 respectively. The figures to the left hand of the separatrix are whole numbers; thus, 4.5 yards is 4 yards and 5 tenths, or one-half of another yard.

Ciphers placed to the right hand of decimals make no alteration in their value ; .5, .50, .500, &c., are decimals of the same value, being each equal to  $\frac{1}{2}$ ; but when placed to the left hand, the value of the fraction is decreased in a tenfold proportion; thus, .5, .05, .005, &c., are 5 tenth parts, 5 hundredth parts, 5 thousandth parts, respectfully.

The different value of figures will appear plaine by the following

TABLE.  
*Integers. Decimals.*

From the above table it appears that as whole numbers

increase in a tenfold proportion from units to the left hand, so decimals decrease in the same proportion to the right: and that in decimals, as in whole numbers, the place of a figure determines its relative value.

*Examples for writing Decimals.*

Five tenths,	,5
Five hundredths	,05
Five thousandths.	,005
Five hundred thousandths,	,0005
Fifty-three thousandths	,053
Five and fifteen hundredths	5,15

**ADDITION OF DECIMALS.**

*Rule.* Place the given numbers so that the decimal points may stand directly under each other; then add as in whole numbers, and point off so many places for decimals to the right as are equal to the greatest number of the decimal places in any of the given numbers.

**EXAMPLES.**

(1.)	(2.)	(3.)
263,51	42,23	2,1
149,28	18,47	,5
293,53	9,3	26,17
184,59	52,384	,7
129,4	2,1	5,
<hr/> 1020,31	<hr/> 124,484	<hr/> 34,47

4. Required, the sum of twenty-nine and three-tenths, three hundred and seventy-four and nine millionths, ninety-seven and two hundred and fifty-three thousandths, three hundred and fifteen and four hundredths, twenty-seven, one hundred and four tenths. *Ans.* 942,993009.

5. Required, the sum of ten dollars and twenty-nine cents, ninety-three cents and three mills, nine cents and six mills, and two dollars and eight mills. *Ans.* \$13,32 cts. 7 m.

**SUBTRACTION OF DECIMALS.**

*Rule.* Place the given numbers so that the decimal points may stand directly under each other, and point off the decimal places, as in Addition.

## EXAMPLES.

(1.)	(2.)	(3.)
From 219.42	87.26	57,
Take 184.38	19.4	9,375
<hr/> 35.04	<hr/> 67.86	<hr/> 47,625

4. From two thousand and sixteen hundredths, take one thousand and four and four millionths. *Ans.* 996,59996.

5. From twenty-four thousand nine hundred and nine and one-tenth, take fourteen thousand and twenty-nine thousandths. *Ans.* 10909,071.

6. Take eighty-five and seven hundred and thirty-seven thousandths from one hundred. *Ans.* 14,263.

7. From five hundred and thirty-one dollars two cents, take one hundred and seventeen dollars three cents and four mills. *Ans.* \$413,98 *cts.* 6*m.*

8. From ten dollars and eight cents, take one dollar and three mills. *Ans.* \$9,07 *cts.* 1*m.*

## MULTIPLICATION OF DECIMALS.

MULTIPLY exactly as in whole numbers, and from the product cut off as many figures for decimals to the right hand as there are decimals in both factors; but if the product should not have so many, supply the defect by prefixing ciphers.

## EXAMPLES.

(1.)	(2.)
Multiply 36.5	29,831
by 7.27	,952
<hr/> 2555	<hr/> 59662
730	149155
2555	268479
<hr/> 265,355	<hr/> 28,399112
(3.)	(4.)
Multiply ,285	,285
by ,8	,003
<hr/> ,2280	<hr/> ,000855
(5.)	
	,29
	,1
	<hr/> ,029

*Note.* To multiply decimal fractions by 10, 100, 1000, &c., is only to remove the separatrix so many places toward the right as there are ciphers.

$$\text{Thus : } 7,362937 \left\{ \begin{array}{l} 10, \\ 100, \\ 1000, \\ 10000, \end{array} \right\} \left\{ \begin{array}{l} 73,62937 \\ 736,2937 \\ 7362,937 \\ 73629,37 \end{array} \right.$$

6. Multiply two thousand and four and two-tenths by twenty-seven.

*Ans.* 54113.4.

## DIVISION OF DECIMALS.

*Rule.* Divide as in whole numbers, and from the right hand of the quotient point off as many places for decimals as the decimal places in the dividend exceed those of the divisor. If the places of the quotient are not so many as the rule requires, supply the defect by prefixing ciphers. If at any time there be a remainder, or the decimal places in the divisor are more than those in the dividend, ciphers may be annexed to the dividend, and the quotient carried to any degree of exactness.

## EXAMPLES.

(1.)

$$\begin{array}{r} 92), 863972,(009391 \\ 828 \\ \hline 359 \\ 276 \\ \hline 837 \\ 828 \\ \hline 92 \\ 92 \\ \hline \end{array}$$

(2.)

$$\begin{array}{r} ,853)89,000(104,337 \\ 853 \\ \hline 3700 \\ 3412 \\ \hline 2880 \\ 2559 \\ \hline 3210 \\ 2559 \\ \hline 6510 \\ 5971 \\ \hline 539 \end{array}$$

3. Divide ,803 by ,22  
 4. Divide 8,03 by 2,2  
 5. Divide ,803 by 22

*Ans.* 3.65  
 365  
 ,0365

6. Divide 80,3 by ,22	36,5
7. Divide 80,3 by 2,2	3,65
8. Divide 222 by 365	,60821 +

*To reduce quantities of several denominations to a decimal.*

*Rule.* Place the several denominations above each other, letting the highest denomination stand at the bottom ; then divide each denomination (beginning at the top) by its value in the next denomination, the last quotient will give the decimal required.

**EXAMPLE.**

1. Reduce 12s 6d 3qrs to the decimal of a pound.

4	3,
12	6,75
20	12,5625
	,628125

2. Reduce 15s 9d 3qrs to the decimal of a pound.

*Ans.* ,790625.

3. Reduce 9d 3qrs to the decimal of a shilling.

*Ans.* ,8125.

*Note.* When the shillings are even, half the number, with a point prefixed, is their decimal expression ; but if the number odd, annex a cipher to the shillings, and then, by halving them, you will have their decimal expression.

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**REDUCTION**

TEACHETH to change numbers from one denomination to another, without losing their value.

When numbers of a higher denomination are to be reduced to a lower, it is called Reduction Descending, and it is performed by Multiplication. When numbers of a lower denomination are to be brought to a higher denomination, it is called Reduction Ascending, and it is performed by Division.

**REDUCTION DESCENDING.**

*Rule.* Multiply the highest denomination by as many of the next less as make one of the greater, adding to the product the parts of the same name, and so on to the last.

## EXAMPLES.

1. In £987 14s 6d 3 qrs, how many farthings ?

$$\begin{array}{r} 987 \ 14 \ 6 \ 3 \\ \hline 20 \end{array}$$

$$\begin{array}{r} 19754 \text{ shillings.} \\ \hline 12 \end{array}$$

$$\begin{array}{r} 237054 \text{ pence.} \\ \hline 4 \end{array}$$

$$\begin{array}{r} 948219 \text{ farthings.} \\ \hline \end{array}$$

2. In 11 oz. 13 dwt. 13 grs., how many grains ?

*Ans. 5605 grs.*

3. In 13 cwt. 3 qrs. 21 lbs., how many pounds ?

*Ans. 1561 lbs.*

4. In 57 years, how many hours, allowing each year to be 365 days 6 hours ?

*Ans. 499662 hours.*

## REDUCTION ASCENDING.

*Rule.* Divide the given number by as many of that denomination as make one of the next higher, and so on to the denomination required, and the last quotient, with the several remainders, if any, will be the answer.

## EXAMPLES.

1. In 46788 farthings, how many pence, shillings, and pounds ?

$$\begin{array}{r} 4)46788 \\ \hline 12)11697 \\ \hline 2,0)97,4-9 \\ \hline 48-14-9 \end{array}$$

*Ans. £48 14s 9d.*

2. In 900 farthings, how many pounds ?

*Ans. £0 18s 9d.*

3. In 243648 farthings, how many dollars, at 6 shillings each ?

*Ans. 846 dollars.*

4. Reduce 13776 pence to guineas, at 28s per guinea.

*Ans. 41 guineas.*

5. In 62304 farthings, how many pistoles, at 22s each ?

*Ans. 59 pistoles.*

6. In 24396 pence, how many shillings, pounds, and pistoles ? *Ans. 2033s, £101 13s, and 92 pistoles and 9s over.*

*Questions promiscuously placed.*

1. Suppose A and B were to travel from Vergennes, in the state of Vermont, to Geneva, in the state of New York, the distance being 300 miles ; A steps 2 feet 6 inches each step, and B but 2 feet 4 inches ; how many more steps must B take to perform his journey than A ? *Ans. 45257.*

2 It is supposed the wars of Bonaparte, in 20 years, caused the death of 2,000,000 of persons ; how many was this per hour, allowing the year to contain 365 days 6 hours ?

*Ans. 111⁷₅₃⁴⁸₂₀.*

3. A goldsmith having 15 ingots of silver, each weighing 2 lbs. 7 oz. 3 dwt., which he wished to make into bowls of 2 lbs. 8 oz., tankards of 1 lb. 10 oz. salts of 11 oz., and spoons of 1 oz. 15 dwt., and of each an equal number ; how many will there be of each sort ? *Ans. 7.*

4. If sound, uninterrupted, moves 1142 feet in one second, how long would it be in passing from the sun to the earth, the distance being estimated at 95,000,000 of miles ?

*Ans. 13 yrs. 338 d. 16 h. 10 m. 22 sec. 11⁷⁵₄₂.*

5. Admit a ship's cargo from London to be 250 pipes, 130 hhd., and 150 half hhd., how many gallons in all, allowing every pint to be a pound, and what is the ship's burden ?

*Ans. 44415 gals., and 158 tons, 12 cwt. 2 qrs.*

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PURE PROPORTION.

HAVING briefly noticed the fundamental and compound rules, together with decimals and reduction, I now come to the rules of proportion ; and here let me remark, that it shall be my endeavour to make this part of my subject so plain that the most obtuse understanding may readily comprehend its principles. All proportions composed of whole numbers, without a fraction, are termed pure proportion ; when a fraction appears, it is only termed proportion.

We have fixed and unfixed pure proportion and proportion. Fixed pure proportion and proportion is unchangeable, as lb. 1 = 16 oz., \$1 = 100 cts. ; these are termed fixed pure proportion or proportion : few only are proportion ; the most of them are pure proportion. We have in our country ft. 16 $\frac{1}{2}$  = 1 rod, and deg. 1 = 69 $\frac{1}{2}$  miles ; these are *fixed* proportion, the

pure proportion of which would be ft.  $33=2$  rods, and deg.  $2=139$  miles. Unfixed proportion and pure proportion originate from unavoidable changes, as, for example, the price of butter or sugar, or the different value of money at different times; 1 lb. of butter costs  $12\frac{1}{2}$  cts.; £9 sterling are \$40. You will observe that the butter may have a higher or lower price, and that the exchange of money may rise or fall, and therefore the pure proportion and proportion are said to be unfixed. By the help of pure proportion and proportion the most of our calculations in ordinary business are performed.

Pure proportion does not change its value if it is multiplied or divided by a number without any remainder, as the pure proportion of  $9=12$  remains the same if multiplied by 4 and raised to  $36=48$ , or if divided by 3 and reduced to  $3=4$ . These proceedings change nothing in the value of the pure proportion, i. e., 9 bears the same proportion to 12 as 36 does to 48, or 3 to 4.

By the help of reduction or diminution of pure proportion we are able to perform solutions of all questions with despatch; and for this purpose a perfect knowledge of the multiplication table is positively necessary; by the help thereof, and by observation of the following rules and remarks, we are able to find, in a sure and easy manner, the common measurer of pure proportion, if a reduction can be made.

Suppose it is required to reduce the pure proportion of  $54=72$ . The multiplication table says,  $6 \times 9 = 54$ , and  $8 \times 9 = 72$ . We comprehend here that 9 is a common measurer for the pure proportion of  $54=72$ , and reduce, the pure proportion to  $6=8$ , which, again divide by 2, gives  $3=4$  for the meanest pure proportion of  $54=72$ . Or let  $24=84$  be the pure proportion; here the multiplication table says,  $12 \times 2 = 24$ , and  $12 \times 7 = 84$ . We see here that 12 is a common measurer, and reduces  $24=84$  to  $2=7$ . It would be superfluous to say more on the multiplication table.

All numbers which have a cipher or 5 for the last figure, have 5 for their common measurer. All numbers of which the last two figures can be divided by 4, that 4 is the common measurer. When you take a lesser, number from a greater, and the remainder will divide the lesser number without any remainder, it will also be the common measurer for the meanest pure proportion.

The figure 2 is a factor in all even numbers; 3 is a factor

in all numbers, the sum of which can be divided by 3 without a remainder. The figure 6 is a factor in all even numbers which have the token of 3 ; 7 has a variety of tokens.

*For two or three figures in a number.*

If the left hand figure or figures make the double of the right hand figures, or if the token can be received by adding or subtracting 7 from the left hand figures, or by adding 7 to the right hand figure, we are sure that 7 is a factor. If the left hand figure is one-fifth of the right hand figures, we are also sure that 7 is a factor.

*For four figures in a number.*

If a division of the two left hand figures in the two right hand figures gives the quotient of 5, as 1155 ; or if the division of the two right hand figures in the two left hand figures gives the quotient of 3, as 6622 ; also, if two equal digits enclose two ciphers, as 1001, to 9009.

*For five figures in a number.*

If one cipher is enclosed by two equal numbers, as 27027.

*Note.* 7, 11, and 13 are factors in all those numbers which have the token of one are two ciphers enclosed by two equal numbers.

8 is a factor in all numbers of which the last three figures can be divided by 8 without a remainder.

9 is a factor in all numbers, if the sum of the figures added will divide by 9.

10 is a factor in all numbers of which the last figure is a cipher.

11 is a factor in all numbers of which the figures subtracted from the right or left hand will leave no remainder, as 3861. If we subtract from the left to the right hand :  $3-8=5-6=1-1=0$  ; or from the right to the left :  $1-6=5-8=3-3=0$ .

12 is a factor in all numbers which have the token of 3 and 4, as 3 multiplied by 4 equals 12.

14 is a factor in all even numbers which have the token of 7.

15 is a factor in all numbers which have the token of 3 and 5.

25 is a factor in all numbers of which the last two figures divide without a remainder.

125 is a factor in all numbers of which the last three figures can be divided by 125.

Any multiplication or division of the numbers 25 and 125 are soon performed, if we raise these factors by a multiplication of 4 or 8 to the potencies of 100 or 1000, raising or reducing the other factor to be multiplied or divided in the same proportion.

This knowledge is necessary for despatch of business, easy calculation and reduction, but seldom taught in arithmetical systems. For the rules of statement by the multiplication and division of fractions, proceed according to the following

## **DIRECTIONS.**

First, draw a perpendicular line, and observe that this line signifies, in all positions of statement, the same as the sign = equality.

That all fractions, compound and mixed, as well as whole numbers, have their place by the multiplication on the right hand side of the perpendicular line, as also the dividend; the divisor only has its place on the left hand side of the perpendicular line. This is clear, and will not be misunderstood.

To bring fractions to whole numbers, the numerator of the fraction remains on its side, and the denominator is put on the other side of the perpendicular line.

In mixed fractions the figure or the whole number is multiplied by the denominator of the fraction, and the numerator added to them ; this product remains on its side of the perpendicular line, and the denominator is put on the other. These simple proceedings are observed in all cases of statement as general rules. In the rule of three, and all other proportional rules, we find that the term upon which the demand lies always gives the third and last position. Suppose by the rule of three ; if 3 yards of cloth cost 7 dollars, what will 15 yards cost ?

$$3 : 7 :: 15 \quad \text{what} \quad | \quad 15 \text{ yards}$$

yards 3 | 7 dollars

But in the rule of pure proportion, as seen in the above example, the term on which the demand lies takes the first place. The advantages and facility of pure proportion stops not here; it is able to join different rules and proportion given in one statement; and, when calculating in this manner, it is unnecessary to reduce the first and third terms to the same denomination, as in the rule of three. This is done by the positions of pure proportion: as, if 1 pint of wine cost 10 pence, how many £ will 3 hhds. cost? In this example the

demand lies on hhds., and the answer required must be £ ; hhds., as mentioned above, give the first position on the right hand side of the perpendicular line ; observe, that we will then commence on the left hand side of the perpendicular line, with the same denomination, which always gives the pure proportion as answer for the right side ; and as soon as the answer or denomination required falls on the right hand side of the perpendicular line, the statement is correct. And if we have the pure proportion in memory, as the multiplication table, we may as easily perform the statement of pure proportion ascendant or descendant.

Farther remarks on the same question. If 1 pint cost 10 pence, how many £ will 3 hhds. cost ? Hhds. are the first, and £ are the last position or answer required ; now, if we go from hhds. descendant by pure proportion to pints, and we receive for 1 pint, after the example, 10 pence for the answer on the right hand side of the perpendicular line ; now we go from pence ascendant to £ ; and as soon as £ fall on the right hand side of the perpendicular line, the statement is performed, as here may be seen—

£	3 hhds.
hhd. 1	63 gals.
gal. 1	4 qts.
qt. 1	2 pts.
pt. 1	10 d.
d. 12	1 shil.
shil. 20	1 £

Last position required. Now we can be sure that the statement is correct, if we have made no error in the position of pure proportion, because the answer or denomination required fell on the right hand side of the perpendicular line. When a question gives particular proportion, which could not be joined according to the rule here given, they must be placed at the end of the statement, after the denomination or answer required.

As ; A buys 742 pounds of wool on the following conditions : to reduce 5 per cent. tret, and to pay for 1 pound neat weight 9 shillings at 6 per cent. discount. He sells this wool again to B on the same conditions, with a profit of 20 per cent. ; how much must B pay to A, in federal money, for the 742 pounds gross weight of wool ?

how many dollars	742 lbs. gross weight
gross weight lbs. 105	100 lbs. neat weight
neat weight lbs. 1	9 shil.
shil. 20	1 £
£ 3	8 dolls.
106	100 dis. } extra
100	120 profit } conditions.

You will see that the extra conditions mentioned in the question for discount and profit, are placed down after you have received the answer or denomination, dollars required.

By the rule of three this question requires 5 statements, and more than 5 times the figures and time, before you are able to obtain the answer required. By fractions the statement runs thus: If  $\frac{4}{5}$  of  $\frac{5}{8}$  of a yard of muslin cost  $\frac{7}{10}$  of  $\frac{3}{4}$  of a £, for how many cents must  $\frac{1}{4}$  of  $\frac{4}{5}$  of a yard be sold to gain 25 per cent.?

how many cts. 4	1 } yd.
5	4 }
yd. { 4	5
5	8
10	7 } £
7	3 }
3	8 dolls.
doll. 1	100 cts.
100	125 gain, extra conditions.

To find the pure proportion of anything, you may suppose one of them, upon which you lay the demand for the first position, as nothing, and proceed to the other by pure proportion for the answer, as, How many £ are \$ ?

how many £	dolls.
doll. 1	100 cts.
cts. 10	9 pence
pence 12	1 shil.
shil. 20	1 £

Resolve both sides to the meanest denomination, and the remainder gives the pure proportion; and the denomination upon which you have laid the demand, falls on the left hand side of the perpendicular line, and is sought on the left hand side of the perpendicular line.

In the solution and reduction of pure proportion, observe the following

## DIRECTIONS.

- 1st. Strike out all equal number of ciphers.
- 2d. Strike out all equal number of figures.
- 3d. Strike out all equal numbers.
- 4th. Look at the statement ; if you can divide with a figure or number from one side to the other, strike out both positions, and the quotient remains on the side of the greater number.
- 5th. If you have figures or numbers on both sides of the line that are not equal, you may suppose some figure that is contained in any two of them without any remainder, and strike out both positions, and place the result opposite each position.
- 6th. Reduction by 5, if 0 and 5 are found at the end of two positions.
- 7th. Reduction by 4.
- 8th. And, finally, reduction by the multiplication table.

As soon as you have finished the reduction according to the above directions, multiply the remainder of the figures or numbers of the right hand side of the perpendicular line, and do the same with the figures or numbers of the left hand side of the perpendicular line ; then divide the product of the right side by the product of the left side for the answer.

You will always find the answer in the meanest fractional denomination, if the figure or number on the left side of the perpendicular line is greater than that on the right hand side ; the answer in this case is a fraction, of which the figure or number on the right hand side is the numerator, and the figure or number of the left side is the denominator.

If the figure or number on the left side can be divided into the product of the right side, the answer will always be in whole numbers with a fraction of the meanest or lowest denomination. When nothing remains on the left hand side, the answer is always in a whole number ; and when nothing remains on one or both sides of the line, the answer is one. But one in all other cases has no value, and is not regarded in the calculation, because one is not a multiplier nor a divisor ; but if one or more ciphers remain, they have then the value of 10 or 100, &c.

To illustrate the foregoing rules and remarks, the first thing in order is fractions. A fraction is a part of a whole number. Fractions are of four kinds, viz., simple fractions, compound fractions, mixed fractions, and improper fractions.

A simple fraction is written thus—

$\frac{1}{2}$     $\frac{2}{3}$     $\frac{3}{4}$     $\frac{4}{5}$     $\frac{5}{6}$     $\frac{8}{16}$     $\frac{89}{100}$    &c.

A compound fraction thus—

$\frac{2}{3}$  of  $\frac{6}{5}$  of  $\frac{14}{5}$  of  $\frac{40}{30}$  of  $\frac{111}{75}$  &c.

A mixed fraction thus—

$2\frac{1}{8}$     $9\frac{4}{14}$     $18\frac{9}{15}$     $60\frac{3}{70}$

An improper fraction thus—

$\frac{5}{3}$     $\frac{8}{5}$     $\frac{20}{8}$     $\frac{40}{1}$     $\frac{100}{50}$

It is important to bear in mind, that fractions arise from division ; and the numerator or figure above the short line may be considered a dividend, and the denominator or figure below the short line, a divisor ; and the value of the fraction is the quotient.

It will be seen from the above, that a simple fraction is one whose numerator is less than its denominator ; and that a compound fraction is a fraction of a fraction, and is expressed by the word *of* ; a mixed fraction is composed of a whole number and a fraction ; an improper fraction is one whose numerator is greater than its denominator.

Fractions are thus expressed :

EXAMPLE.

It is required to express  $\frac{7}{10}$     $\frac{4}{6}$     $\frac{9}{11}$     $\frac{8}{12}$     $\frac{1}{8}$     $\frac{3}{5}$

10	7
6	4
11	9
12	8
8	4
9	3

It will be seen from the above, that the numerator takes its place on the right hand side of the perpendicular line, and the denominator opposite, for the reason that divisors only are placed on the left, and dividends on the right hand side of the perpendicular line. As has been stated, the denominator of a fraction is the divisor, and the numerator the dividend. Mixed fractions may be reduced to improper ones by multiplying the whole number by the denominator of the fraction, and adding the numerator thereto.

## EXAMPLE.

It is required to reduce  $4\frac{3}{7}$  to an improper fraction.

$$\begin{array}{r} 4\frac{3}{7} \\ 7 \\ \hline 31 \\ \hline 7 \end{array}$$

Expressed on the line 7 | 31

The scholar is now prepared, I trust, to work questions adapted to the rules which have been taught above.

## MULTIPLICATION.

Multiply or reduce  $\frac{2}{7}$  of  $\frac{7}{8}$  of  $\frac{8}{9}$  to a simple fraction.

$$\begin{array}{r} -7 \quad 2 \\ -8 \quad 7 \\ -9 \quad 8 \\ \hline \end{array}$$

$$9 \mid 2 = \frac{2}{9} \text{ Answer.}^*$$

It will be seen from the above, that we have expressed on the line compound fractions, agreeable to the rules already laid down.

The marks against the figures show that they are cancelled, agreeable to my rule, which says, strike out all equal numbers or figures. (See directions.)

You will observe that we have expressed on the right of the line 7, and we have also 7 on the left; an 8 on the right, and an 8 on the left: these figures we cancel; after we have finished cancelling, we have remaining 2 on the right and 9 on the left side of the line; therefore, agreeable to rule, the answer is a fraction, viz.,  $\frac{2}{9}$ : after we have expressed our examples on the line agreeable to rule, viz., divisors on the left and dividends on the right, our first business is to cancel such figures or numbers as are alike from left to right or from right to left. These simple proceedings are to be observed in all cases.

* Usually, in operations with the pen, the number cancelled is crossed out; but here, for the want of a better, we use a — for a mark of cancellation.

It is required to multiply or reduce  $\frac{3}{5}$  of 8 by  $\frac{7}{8}$  of 5.

$$\begin{array}{r} \overline{-5} \quad | \quad 3 \\ \quad \quad \quad | \quad 8 \\ \overline{-8} \quad | \quad 7 \\ \quad \quad \quad | \quad 5 \\ \hline \end{array}$$

| 21 Answer.

In the above example we have multiplied  $\frac{3}{5}$  of 8 by  $\frac{7}{8}$  of 5 : we have 5 on the left and 5 on the right ; we have also 8 on the left and 8 on the right ; these we cancel, our divisors being all cancelled, we then multiply the figures remaining on the right hand side together for the answer, which is 21 : had there been figures or numbers on the left of the line that could not have been cancelled, we should have divided the product of the right hand side by the product or remaining figure of the left. For

EXAMPLE.

Multiply  $12\frac{3}{5}$  by  $\frac{1}{3}$  of 7.

$$\begin{array}{r} \overline{-3} \quad | \quad 63 \quad 21 \\ \quad \quad \quad | \quad 1 \\ \quad \quad \quad | \quad 7 \\ \hline \end{array}$$

5 | 147 = 29 $\frac{2}{5}$  Answer.

In the last example we have a mixed fraction, viz.,  $12\frac{3}{5}$  ; the whole number being multiplied by the denominator, and the numerator added =  $\frac{63}{5}$ , now the example would read thus : multiply  $\frac{63}{5}$  by  $\frac{1}{3}$  of 7 ; 3 is contained in 63 21 times, therefore, we strike out both positions, and place the 21 on the side of the greater number ; then we multiply the figures that remain on the right hand side of the line together for a dividend, and divide this product by 5, the number that remains on the left, for the answer. The scholar should pay strict attention to rules of cancellation. One remark more.

If you have figures or numbers on the right and left that will not cancel, you may suppose any number that is contained in any two of them without a remainder.

EXAMPLE.

Multiply or reduce  $\frac{8}{20}$  and  $\frac{9}{12}$  to the lowest terms.

$$\begin{array}{r} \overline{-4} \quad | \quad -20 \quad 8 \quad 2 \\ \quad \quad \quad | \quad -12 \quad 9 \quad 3 \\ \hline \end{array}$$

10 | 3 =  $\frac{3}{10}$

In the above example we have expressed  $\frac{8}{20}$  and  $\frac{9}{13}$ ; we cannot say that 9 is contained in 12 without any remainder, neither can we say that 9 is contained in 20 without a remainder, nor 8 in 20, nor 8 in 12; but we suppose some number that is contained in 8 and 20; for instance, 4 is contained in 8 two times, and 4 is also contained in 20 5 times; again, I suppose 3 to be contained in 9 3 times, and 3 is also contained in 12 4 times, or that 4 is contained in 8 2 times, and 2 is contained in 20 10 times. This is easy, and will not be misunderstood.

1. Multiply  $2\frac{1}{2}$  by  $1\frac{1}{7}$ , and this again by  $\frac{1}{2}$  of  $\frac{3}{4}$  of  $\frac{2}{3}$ .

$$\begin{array}{r} -3 \mid 7 \\ -7 \mid 8 \quad 4 \\ -2 \mid 1 \\ -4 \mid 3 \\ 3 \mid 2 \\ \hline \end{array}$$

$$3 \mid 2 = \frac{2}{3} \text{ Ans.}$$

2. Multiply  $12\frac{3}{4}$  by  $7\frac{3}{4}$ .

$$\begin{array}{r} 5 \mid 63 \quad 21 \\ ---3 \mid 23 \\ \hline \end{array}$$

$$5 \mid 483 = 96\frac{3}{4} \text{ Ans.}$$

3. Multiply or reduce  $\frac{4}{5}$  of  $\frac{5}{8}$  of  $\frac{7}{9}$  to a simple fraction.

$$\begin{array}{r} ---5 \mid 4 \\ ---8 \mid 5 \\ 9 \mid 7 \\ \hline \end{array}$$

$$18 \mid 7 = \frac{7}{18} \text{ Ans.}$$

4. Multiply or reduce  $\frac{3}{4}$  of  $\frac{5}{6}$  of  $\frac{9}{10}$  to a simple fraction.

$$\begin{array}{r} 4 \mid 3 \\ 2 \mid 6 \mid 5 \\ 2 \mid 10 \mid 9 \\ \hline \end{array}$$

$$16 \mid 9 = \frac{9}{16} \text{ Ans.}$$

5. Multiply  $\frac{7}{3}$  by  $\frac{5}{9}$ .

$$\begin{array}{r} 7 \mid 3 \\ 3 \mid 9 \mid 5 \\ \hline \end{array}$$

$$21 \mid 5 = \frac{5}{21} \text{ Ans.}$$

6. Multiply or reduce  $\frac{2}{3}$  of  $\frac{4}{5}$  of  $\frac{3}{4}$  of  $\frac{6}{7}$  of 4 to a simple fraction.

$$\begin{array}{r} \overline{4} \bigg| \overline{3} \\ \overline{6} \bigg| \overline{4} \\ \overline{3} \bigg| \overline{2} \\ \overline{2} \bigg| \overline{8} \bigg| \overline{6} \\ \hline & & \overline{4} \end{array}$$

$\overline{3} \bigg| \overline{1} \quad \text{Ans.}$

7. Multiply  $\frac{1}{2}$  by  $\frac{5}{8}$ .

$$\begin{array}{r} \overline{5} \bigg| \overline{4} \\ \overline{4} \bigg| \overline{16} \bigg| \overline{15} \overline{3} \\ \hline & & 4 \bigg| 3 = \frac{3}{4} \end{array}$$

$\text{Ans.}$

8. Multiply  $\frac{1}{2}$  of  $\frac{2}{3}$  by  $\frac{1}{4}$  of  $\frac{4}{5}$  of  $\frac{5}{6}$ .

$$\begin{array}{r} \overline{2} \bigg| \overline{1} \\ \overline{3} \bigg| \overline{2} \\ \overline{4} \bigg| \overline{3} \\ \overline{5} \bigg| \overline{4} \\ \overline{6} \bigg| \overline{5} \\ \hline & & 6 \bigg| 1 = \frac{1}{6} \end{array}$$

$\text{Ans.}$

9. Multiply  $\frac{1}{2}$  of 7 by  $\frac{3}{2}$ .

$$\begin{array}{r} \overline{2} \bigg| \overline{1} \\ & \bigg| \overline{7} \\ \overline{2} \bigg| \overline{6} \bigg| \overline{3} \\ \hline & & 4 \bigg| 7 = 1\frac{3}{4} \end{array}$$

$\text{Ans.}$

10. Multiply  $4\frac{2}{3}$  by  $2\frac{4}{13}$ .

$$\begin{array}{r} \overline{6} \bigg| \overline{26} \overline{2} \\ \overline{13} \bigg| \overline{30} \overline{5} \\ \hline & & 10 \end{array}$$

$\text{Ans.}$

11. Multiply  $\frac{1}{2}$  of 8 by  $\frac{5}{4}$  of 10.

$$\begin{array}{r} \overline{4} \bigg| \overline{3} \\ & \bigg| \overline{8} \overline{4} \\ \overline{2} \bigg| \overline{6} \bigg| \overline{5} \\ \hline & & 10 \end{array}$$

$\text{Ans.}$   
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12. Multiply  $\frac{3}{4}$  of 12 by  $\frac{7}{4}$  of 8.

$$\begin{array}{r} -7 \\ \hline -2 -24 \\ \hline \end{array} \left| \begin{array}{r} 8-4 \\ 12- \\ 7- \\ 8 \end{array} \right. \quad | 32 \text{ Ans.}$$

13. Multiply  $4\frac{2}{7}$  by  $1\frac{7}{5}$ .

$$\begin{array}{r} -7 \\ \hline -15 \\ \hline \end{array} \left| \begin{array}{r} 30-2 \\ 7- \\ \hline \end{array} \right. \quad | 2 \text{ Ans.}$$

14. Multiply  $3\frac{3}{4}$  by  $1\frac{3}{11}$  of 8.

$$\begin{array}{r} ---3-6 \\ \hline ---11 \\ \hline \end{array} \left| \begin{array}{r} 22-2- \\ 3- \\ 8 \end{array} \right. \quad | 8 \text{ Ans.}$$

15. Multiply  $\frac{1}{2}$  of  $\frac{2}{3}$  of  $\frac{4}{5}$  by  $\frac{2}{3}$  of 9.

$$\begin{array}{r} ---3 \\ ---4 \\ ---3-6 \\ \hline 8 \\ \hline \end{array} \left| \begin{array}{r} 2- \\ 3- \\ 4- \\ 3- \\ 9 \end{array} \right. \quad | 8 \text{ Ans.}$$

16. Multiply  $15\frac{1}{5}$  by  $\frac{20}{38}$ .

$$\begin{array}{r} ---5 \\ \hline ---38 \\ \hline \end{array} \left| \begin{array}{r} 76-2 \\ 20-4 \end{array} \right. \quad | 8 \text{ Ans.}$$

17. Multiply  $\frac{3}{4}$  of  $\frac{2}{6}$  by  $\frac{2}{3}$  of 90.

$$\begin{array}{r} ---2-4 \\ ---6 \\ ---3 \\ \hline \end{array} \left| \begin{array}{r} 3- \\ 2- \\ 2- \\ 90-15 \end{array} \right. \quad | 15 \text{ Ans.}$$

18. Multiply  $9\frac{1}{2}$  by  $\frac{1}{2}$  of  $\frac{1}{2}$ .

$$\begin{array}{c|c}
 2 & 19 \\
 2 & 1 \\
 4 & 3 \\
 \hline
 16 & 57 = 3 \frac{9}{16} \quad \text{Ans.}
 \end{array}$$

19. Multiply  $\frac{3}{8}$  by  $\frac{4}{9}$ .

$$\begin{array}{r} 2 -8 \\ 3 -9 \end{array} \bigg| \begin{array}{r} 3 \\ 4 \end{array}$$

20. Multiply  $5\frac{1}{4}$  by  $\frac{1}{6}$ .

$$\begin{array}{r}
 4 \mid 21 - 7 \\
 2 - 6 \mid 1 \\
 \hline
 8 \mid 7 - 1 \quad \text{Ans.}
 \end{array}$$

21. Multiply  $\frac{3}{9}$  of 7 by  $\frac{3}{4}$  of 4.

$$\begin{array}{r}
 \underline{-3} \quad \underline{-9} \quad | \quad \underline{3} \\
 \quad \quad \quad | \quad \underline{7} \\
 \quad \quad \quad | \quad \underline{3} \\
 \hline
 \quad \quad \quad | \quad \underline{4} \\
 \hline
 \quad \quad \quad | \quad \underline{4} \quad \text{Ans.}
 \end{array}$$

22. Multiply  $\frac{2}{3}$  of  $\frac{5}{6}$  by  $\frac{3}{8}$  of 20.

$$\begin{array}{r}
 \hline
 & \text{---} 5 & | & 2 \text{---} \\
 & \text{---} 2 & | & 6 \text{---} \\
 2 & \text{---} 4 & | & 8 \text{---} \\
 \hline
 & & | & 20 \text{---} 10 \text{---} 5 \\
 \hline
 & 2 & | & 5 = 2\frac{1}{2} \quad \text{Ans.}
 \end{array}$$

*Note.* In the division of fractions invert the divisor, and proceed as in Multiplication of fractions.

### EXAMPLES.

1. Divide  $\frac{1}{2}$  by  $\frac{1}{4}$ .

$$\begin{array}{r|rr} -2 & 1 & \\ \hline 1 & 4 & \dots 2 \\ \hline & 2 & \text{Ans.} \end{array}$$

2. Divide  $\frac{1}{4}$  by  $\frac{1}{2}$ .

$$\begin{array}{r} 2 \text{---} 4 \\ \text{---} 1 \\ \hline 2 \mid 1 \text{---} \end{array} \quad \text{Ans.}$$

3. Divide  $\frac{1}{2}$  of 19 by  $\frac{2}{3}$  of  $\frac{1}{4}$ .

$$\begin{array}{r} \text{---} 4 \\ \text{---} 2 \\ \text{---} 3 \\ \hline 2 \mid 19 \text{---} \end{array}$$

$$2 \mid 19 = 9\frac{1}{2} \quad \text{Ans.}$$

4. Divide  $\frac{3}{4}$  of  $\frac{1}{2}$  by  $\frac{1}{2}$  of  $\frac{1}{3}$ .

$$\begin{array}{r} \text{---} 3 \\ \text{---} 2 \\ \text{---} 1 \\ \hline 2 \mid 3 \text{---} \end{array}$$

$$2 \mid 3 = 1\frac{1}{2} \quad \text{Ans.}$$

5. Divide  $4\frac{1}{2}$  by  $\frac{5}{6}$  of 4.

$$\begin{array}{r} \text{---} 9 \\ \text{---} 5 \\ \text{---} 4 \\ \hline \end{array}$$

$$20 \mid 41 = 2\frac{1}{20} \quad \text{Ans.}$$

6. Divide  $\frac{3}{8}$  of 27 by  $\frac{3}{12}$  of 24.

$$\begin{array}{r} \text{---} 9 \\ \text{---} 3 \\ \text{---} 3 \\ \hline 2 \mid 24 \end{array}$$

$$2 \mid 3 = 1\frac{1}{2} \quad \text{Ans.}$$

7. Divide  $\frac{5}{8}$  of  $\frac{8}{12}$  of 6 by  $\frac{3}{7}$  of  $\frac{7}{9}$  of 8.

$$\begin{array}{r} \text{---} 8 \\ \text{---} 3 \mid 12 \\ \text{---} 3 \\ \text{---} 7 \\ \hline 4 \mid 8 \end{array}$$

$$4 \mid 3 = \frac{3}{4} \quad \text{Ans.}$$

8. Divide  $4\frac{3}{7}$  by  $\frac{3}{4}$  of 31.

$$\begin{array}{r}
 7 \mid 31 \\
 3 \mid 4 \\
 \hline
 31 \\
 \hline
 21 \mid 4 = 21
 \end{array}
 \quad \text{Ans.}$$

9. Divide  $\frac{5}{8}$  of 4 by  $4\frac{1}{2}$ .

$$\begin{array}{r|l} -9 & 5 \\ & 4 \\ \hline 41 & 9 \end{array}$$

10. Divide  $\frac{3}{7}$  of 8 by  $\frac{6}{21}$  of 4.

$$\begin{array}{r}
 7 \mid 3 \\
 8 \quad 2 \\
 \hline
 2 \quad 6 \quad 21 \quad 3 \\
 \hline
 4
 \end{array}$$

11. Divide  $\frac{9}{12}$  by  $\frac{3}{6}$ .

$$\begin{array}{r|l} 2 & -12 \\ \hline & -3 \end{array}$$

12. Divide  $\frac{8}{10}$  of 40 by  $\frac{2}{5}$  of 20.

$$\begin{array}{r|rr}
 -2 & -10 & 8 \dots 4 \\
 & -2 & 40 \dots 2 \dots \\
 & -2 & 5 \dots \\
 & -20 &
 \end{array}$$

13. Divide  $3\frac{4}{5}$  by  $2\frac{5}{8}$ .

$$\begin{array}{r|rr} \cdots 7 & 25 \cdots \\ \cdots 25 & 49 \cdots & 7 \\ \hline & 17 & 4 \cdots \end{array}$$

14. Divide  $\frac{4}{7}$  by  $\frac{2}{3}$ .

$$\begin{array}{r}
 7 \mid 4 \quad 2 \\
 \underline{-2} \mid 3 \\
 \hline
 7 \mid 6 \quad 6 \\
 \end{array}
 \quad \text{Ans.}$$

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15. Divide  $\frac{14}{18}$  by  $\frac{7}{10}$ .

$$\begin{array}{r} 9 \text{ --- } 18 \\ \text{--- } 7 \text{ --- } 10 \\ \hline \end{array}$$

$$9 \mid 10 = \frac{1}{9} \text{ Ans.}$$

16. Divide  $1\frac{1}{2}$  by  $4\frac{8}{10}$ .

$$\begin{array}{r} \text{--- } 2 \text{ --- } 3 \\ 16 \text{ --- } 48 \text{ --- } 10 \\ \hline \end{array}$$

$$16 \mid 5 = \frac{5}{16} \text{ Ans.}$$

17. Divide  $3\frac{1}{6}$  by  $9\frac{1}{2}$ .

$$\begin{array}{r} 3 \text{ --- } 6 \text{ --- } 19 \\ \text{--- } 19 \text{ --- } 2 \\ \hline \end{array}$$

$$3 \mid 1 = \frac{1}{3} \text{ Ans.}$$

18. Divide  $\frac{1}{4}$  of  $\frac{1}{3}$  by  $\frac{1}{2}$  of  $\frac{3}{4}$ .

$$\begin{array}{r} \text{--- } 2 \text{ --- } 1 \\ \text{--- } 4 \text{ --- } 1 \\ 3 \text{ --- } 2 \\ 1 \text{ --- } 8 \\ 3 \text{ --- } 4 \\ \hline \end{array}$$

$$9 \mid 8 = \frac{8}{9} \text{ Ans.}$$

19. Divide  $\frac{6}{5}$  of  $\frac{4}{5}$  by  $\frac{3}{5}$  of 8.

$$\begin{array}{r} 2 \text{ --- } 8 \text{ --- } 5 \\ \text{--- } 5 \text{ --- } 4 \\ 3 \text{ --- } 5 \\ 8 \text{ --- } \\ \hline \end{array}$$

$$48 \mid 5 = \frac{5}{48} \text{ Ans.}$$

20. Divide  $\frac{7}{8}$  by 7.

$$\begin{array}{r} 8 \text{ --- } 7 \\ \text{--- } 7 \text{ --- } \\ \hline \end{array}$$

$$8 \mid 1 = \frac{1}{8} \text{ Ans.}$$

## MULTIPLICATION AND DIVISION OF FRACTIONS.

1. Divide  $\frac{1}{4}$  of 19 by  $\frac{1}{3}$  of  $\frac{1}{2}$ , and multiply it by  $\frac{1}{2}$  of 6.

$$\begin{array}{r} \overline{-4} \bigg| \begin{array}{r} 1 \\ 19 \\ -2 \\ -3 \\ -3 \\ -3 \\ \hline 19 \end{array} \\ \text{Ans.} \end{array}$$

2. Divide  $3\frac{1}{3}$  of  $\frac{5}{6}$  by  $\frac{1}{6}$  of 10. Multiply it by  $\frac{5}{8}$  of  $\frac{9}{7}$ . Divide the product by  $\frac{7}{8}$  of 3. Multiply again by  $2\frac{1}{2}$  of 7 for the answer.

$$\begin{array}{r} \overline{-3} \bigg| \begin{array}{r} 10 \\ 5 \\ 6 \\ -10 \\ -8 \\ 5 \\ 9 \\ -7 \\ 8 \\ -3 \\ -5 \\ 12 \\ 7 \\ \hline 60 \end{array} \\ \text{Ans.} \end{array}$$

3. Divide  $\frac{1}{2}$  of  $\frac{4}{3}$  by  $\frac{4}{5}$  of 8. Multiply it by  $\frac{8}{9}$  of  $\frac{3}{7}$  of 12. Divide by  $\frac{6}{7}$  of 12. Multiply by  $\frac{3}{5}$  of 20. Divide by  $\frac{5}{12}$  of 8. Multiply by  $\frac{4}{5}$  of 30.

$$\begin{array}{r} \overline{-3} \bigg| \begin{array}{r} 2 \\ 3 \\ 6 \\ 8 \\ -9 \\ 7 \\ 6 \\ 3 \\ 12 \\ -6 \\ -12 \\ 3 \\ -5 \\ -5 \\ 8 \\ -6 \\ 4 \\ 30 \\ \hline 24 \end{array} \\ \text{Ans.} \end{array}$$

4. Divide  $20\frac{2}{5}$  by  $\frac{5}{7}$ . Multiply by  $30\frac{1}{2}$ . Divide by  $5\frac{1}{2}$ .  
 Multiply by  $\frac{4}{5}$  of 7. Divide by  $10\frac{3}{5}$ . Multiply by  $\frac{9}{20}$  of 100.

---5	102	2
---51	7	0
---7	212	4
3 ---12	9	
---9	4	
	7	
---53	5	
---20	8	
	100	5

$3 | 5600 = 1866\frac{2}{3}$  Ans.

5. Divide  $\frac{4}{5}$  of  $\frac{3}{8}$  by  $\frac{2}{3}$  of  $\frac{3}{5}$ . Multiply by  $\frac{4}{5}$  of  $\frac{8}{9}$  of 2. Divide by  $\frac{1}{2}$  of  $\frac{2}{3}$  of  $9\frac{1}{2}$ . Multiply by  $\frac{3}{4}$  of 360.

---3	9	4
---8	3	
---2	7	
---3	6	2
---7	4	
---9	8	
	2	
---4	5	
---5	6	2
---19	2	
---40	38	2
	360	4

$| 64$  Ans.

6. Divide  $\frac{2\frac{1}{2}}{5}$  by  $\frac{3}{18}$  of 12. Multiply by  $\frac{2}{3}$  of  $\frac{4}{5}$  of  $\frac{5}{6}$  of 60. Divide by  $\frac{2}{3}$  of 360.

---30	24	2
---3	18	
---12		
---3	2	
---2 ---4	3	
8	5	
	60	2
---3	9	3
2 ---4 ---20	360	

$16 | 1 = \frac{1}{16}$  Ans.

## PURE PROPORTION.

7. Multiply  $\frac{4}{5}$  of  $\frac{5}{8}$  of 9. Divide by  $\frac{8}{5}$  of 5. Multiply by  $\frac{3}{4}$  of 6. Divide by  $\frac{4}{5}$  of 15. Multiply by  $\frac{5}{8}$  of 12. Divide by  $\frac{3}{5}$  of 6. Multiply by  $\frac{1}{24}$  of 4. Divide by  $\frac{7}{8}$  of 12. Multiply by  $\frac{1}{20}$  of 100.

---	5	4	—
---	9	5	—
---	9	9	—
---	9	6	2
---	5	—	
---	3	2	—
---	6	—	
---	4	5	—
---	3	—	
---	15	5	—
---	8	—	
---	8	12	—
---	3	—	
---	8	8	—
---	6	—	
---	4	24	18 3 —
---	7	—	
---	12	—	
---	20	14	2 —
		10	0 —

3 | 40 =  $13\frac{1}{3}$  Ans.

## ADDITION AND SUBTRACTION OF FRACTIONS.

These operations are easily performed, if the fractions have common denominators, by merely adding the numerators together and placing their common denominator under the sum of the numerators for the answer.

To add or subtract fractions not having a common denominator, bring the different denominators to a common denominator, or the least common denominators to a common "multiple," or the least common denominator, and raise the different numerators by the common denominator, and retain the same proportion, after which add as above.

To bring different fractions to a common denominator, the largest denominator is retained: but all other denominators which, according to the properties of figures or numbers, can be resolved into any common factor contained in the large denominator, or any other denominator which is retained, are cancelled or thrown out of the question, after which in

tiply the remaining denominators or figures or numbers to a continued product for the least common denominator.

*For Example.* Find the last common denominator or multiple in the following series of denominators, from 2 to 10 inclusive : 2 3 4 5 6 7 8 9 10.

- 10 being the largest denominator, 10 is retained.
- 9 has no factor in common with 10, therefore 9 is retained
- 8 has a relation or factor in common with 10, to wit, 2 : 2 cancelled into 8 leaves 4, therefore 4 is set down.
- 7 has no relation or factor in common with 10, 9, or 4, therefore 7 is retained.
- 6 has two factors, 2 and 3: the 2 is contained or cancelled in 10, and the 3 in 9, therefore 6 is left out.
- 5 is contained or cancelled in 10, therefore 5 is left out.
- 4 is contained or cancelled in 4, therefore 4 is left out.
- 3 is contained or cancelled in 9, therefore 3 is left out.
- 2 is contained or cancelled in 4 or 10, therefore 2 is left out.

Now the numbers retained or remaining, to wit, 10, 9, 4, 7, multiplied to a continued product, form the least common denominator, by which raise the numerator 2520.

in the same proportion, that is, by dividing the common multiple of each denominator, and multiplying the quotient by the numerator of the respective denominators; and this done, then add as above.

#### RULE OF PURE PROPORTION.

By the general rules of geometrical proportion, as here presented, all arithmetical operations which, in other systems of arithmetic, are arranged under the heads of single or double rule of three, (direct and inverse,) practice, interest, discount, loss and gain, barter, exchange, and others, may be easily, and with simplicity and brevity, solved.

*Rule 1st.* Read the question: And as soon as the expression "how much—how many—yards—dollars—pounds—

"hundred weight—days—men," or anything or quantity demanded, meets the ear, place its sign (for an index of the answer required by the question) on the left hand side of the perpendicular line, and the position or positions (i. e. the terms or constituents of the problem) whereupon the question lies, or for what an equality or answer is required, on the right hand side of the perpendicular line. This is the first step, and is to be observed in all cases.

For the next step, look back at the "if or at—the agreement—condition or supposition" of the question. If this first position or positions (i. e., its terms or constituents) be of the same name with the position whereupon the question lies, place it on the left of the perpendicular line, and the second position or positions of the "if" or "at" on the right hand side of the perpendicular line. If this position is of the same name with the equality or answer required, the statement is performed.

## EXAMPLE.

If 3 yards of cloth cost 7 dollars, how many dollars will 15 yards cost?

Statement.

$$\begin{array}{r} \$ \mid 15 \text{ yards} \\ \text{yards } 3 \mid 7\$ \end{array}$$

Solution.

$$\begin{array}{r} -3 \mid 15 \text{— } 5 \\ \text{— } 7 \end{array}$$

| \$35. Answer.

You will observe, in the above statement and solution, that the demand lies on 15 yards; this we place on the right hand side of the perpendicular line, the index we place on the left, directly opposite for the answer required. The "if" or supposition we place on the left. The term that is of the same name or kind with the answer, we place on the right. It will be understood that, if we want our answer in dollars, &c., our term on the right must be dollars, &c.

1. If 6 yards of broadcloth cost 18 dollars, how many dollars will 5 yards cost?

$$\begin{array}{r} -6 \mid 5 \\ \text{— } 18 \text{— } 3 \\ \hline \end{array}$$

| \$15 Ans.

2. If 4 pounds of snuff cost 1 dollar and 12 cents, how many dollars will 40 pounds cost?

$$\begin{array}{r} -4 \mid -40 \\ \hline 112 \end{array}$$

| \$11,20 cts. *Ans.*

3. If 6 Arithmetics cost 12 dollars, how many dollars will 9 Arithmetics cost?

$$\begin{array}{r} -6 \mid 9 \\ \hline 12 - 2 \\ \hline \end{array}$$

| \$18 *Ans.*

4. If 12 dollars will buy 36 yards of cloth, how many yards will 30 dollars buy?

$$\begin{array}{r} -12 \mid 30 \\ \hline 36 - 3 \\ \hline \end{array}$$

| 90 yds. *Ans.*

5. If  $7\frac{1}{2}$  yards of calico cost  $2\frac{1}{2}$  dollars, what will 30 yards cost?

$$\begin{array}{r} -3 -15 \mid -3 0 \\ \hline 2 \\ -2 \mid 5 \\ \hline \end{array}$$

| \$10 *Ans.*

6. If  $4\frac{1}{8}$  barrels of flour cost 25 dollars, what will 37 barrels cost?

$$\begin{array}{r} -37 \mid 37 - \\ \hline 8 \\ \hline 25 \end{array}$$

| \$200 *Ans.*

7. If  $2\frac{1}{8}$  pounds of snuff cost 26 cents, what will  $\frac{3}{4}$  of  $\frac{1}{4}$  of 9 pounds cost?

$$\begin{array}{r} -4 \mid 3 - \\ -2 -6 \mid 4 - \\ \hline 9 \\ -13 \mid 6 \\ \hline 26 - 2 - \\ \hline \end{array}$$

| 54 cts. *Ans.*

8. If  $\frac{1}{8}$  of  $\frac{3}{4}$  of  $\frac{5}{6}$  of a yard of linen cost 18 cents, what will 3 yards cost?

	3
1	2
—2	3
—3	4
—4	9
	18

| \$4.86 Ans.

9. In 1920 pence, how many £?

1920	16	8
—12	1	
—20	1	

| £8 Ans.

10. In 120 shillings, how many £?

120	6
—20	1

| £6 Ans.

11. In 576 farthings, how many shillings?

576	48	12
—4	1	
—12	1	

| 12s Ans.

12. In 720 shillings, how many dollars, at 8 shillings each?

720	90
—8	1

| \$90 Ans.

13. In 450 shillings, how many dollars, at 6 shillings each?

450	75
—6	1

| \$75 Ans.

14. In £10, how many dollars, at 8 shillings each?

10	5
1	20
—2	—8

| \$25 Ans.

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15. In £18, how many dollars, £3=\$8?

$$\begin{array}{r} 18-6 \\ -3 \mid 8 \\ \hline \end{array}$$

| \$48 Ans.

16. In 48 dollars, how many £, \$8=£3?

$$\begin{array}{r} 48-6 \\ -8 \mid 3 \\ \hline \end{array}$$

| £18 Ans.

17. In 25 dollars, how many £, \$5=£2?

$$\begin{array}{r} 25-5 \\ -5 \mid 2 \\ \hline \end{array}$$

| £10 Ans.

18. In 240 pennyweights, how many pounds?

$$\begin{array}{r} 240-2 \\ -2 \mid 1 \\ \hline -12 \mid 1 \\ \hline \end{array}$$

| 1 lb. Ans.

19. In 480 grains, how many pennyweights?

$$\begin{array}{r} 480-20 \\ -24 \mid 1 \\ \hline \end{array}$$

| 20 dwt. Ans.

20. In 480 pennyweights, how many pounds?

$$\begin{array}{r} 480-4-2 \\ -20 \mid 1 \\ -12 \mid 1 \\ \hline \end{array}$$

| 2 lbs. Ans.

21. In 960 grains, how many ounces?

$$\begin{array}{r} 960-4-2 \\ -24 \mid 1 \\ -20 \mid 1 \\ \hline \end{array}$$

| 2 Ans.

22. In 448 pounds, how many cwt.?

$$\begin{array}{r} 448 - 112 - 4 \\ -28 \bigg| 1 \\ -4 \bigg| 1 \\ \hline \end{array}$$

| 4 cwt. Ans.

23. In 6720 pounds, how many tons?

$$\begin{array}{r} 6720 - 24 - 6 - 3 \\ -28 \bigg| 1 \\ -4 \bigg| 1 \\ -20 \bigg| 1 \\ \hline \end{array}$$

| 3 tons. Ans.

24. In 180 seconds, how many minutes?

$$\begin{array}{r} 180 - 3 \\ -60 \bigg| 1 \\ \hline \end{array}$$

| 3 min. Ans.

25. A gentleman bought 4 barrels of flour at 6 dollars a barrel, paid for them in beef at 8 dollars per cwt.; how many cwt. of beef did it take?

$$\begin{array}{r} 4 - \\ -2 - 8 \bigg| 6 - 3 \\ \hline \end{array}$$

| 3 cwt. Ans.

26. A gentleman hired a horse to ride, and agreed to give 8 cents a mile; he paid 96 cents: how many miles did he ride?

$$\begin{array}{r} 96 - 12 \\ -8 \bigg| 1 \\ \hline \end{array}$$

| 12 miles. Ans.

27. How many times will a ship, 240 feet long, sail her length in the distance of 8 miles?

$$\begin{array}{r} 8 - \\ 1 \bigg| 8 \\ 1 \bigg| 40 - 2 \\ 1 \bigg| 33 - 11 \\ \hline 2 \\ -30 - 240 \\ \hline \end{array}$$

| 176 Ans.

28. The circumference of a wheel is 15 feet; how many revolutions will it make in 2 miles?

$$\begin{array}{r}
 & 2 \\
 1 & 8 \\
 1 & 40 \quad 8 \\
 1 & 33 \quad 11 \\
 \hline
 -2 & \\
 \hline
 -3 & 15 \\
 \hline
 \end{array}$$

| 704 Ans.

29. How many times did Capt. Cook sail the length of his vessel, which was 200 feet long, in circumnavigating the globe, it being 24,800 miles in circumference?

$$\begin{array}{r}
 & 248\ 00 \\
 1 & 8 \quad 4 \quad 2 \\
 1 & 40 \\
 1 & 33 \\
 \hline
 -2 & \\
 \hline
 -200 \\
 \hline
 \end{array}$$

| 654720 Ans.

30. If one pint of wine cost 10 pence, how many £ will 3 hhds. cost?

$$\begin{array}{r}
 \text{f} \quad 3 \\
 1 \quad 63 \\
 1 \quad 4 \\
 1 \quad 2 \\
 1 \quad 1 \quad 0 \\
 \hline
 -3 \quad -12 \quad 1 \\
 \hline
 -20 \quad 1 \\
 \hline
 \end{array}$$

| £63 Ans.

31. If 2 quarts of cider cost 18 pence, how many pounds will 12 hhds. cost?

$$\begin{array}{r}
 & 12 \\
 1 & 63 \\
 1 & 4 \\
 \hline
 -2 & 18 \quad 9 \\
 \hline
 -12 & 1 \\
 \hline
 5 \quad -20 & 1 \\
 \hline
 \end{array}$$

5 | 567 = £113 $\frac{2}{3}$  Ans.

32. If 3 quarts of brandy cost 12 shillings, how many pounds will 9 hhds. cost?

$$\begin{array}{r}
 9 \quad 3 \\
 1 \quad 63 \\
 1 \quad 4 \\
 -3 \quad 12 \\
 \hline
 5 \quad 20 \quad 1
 \end{array}$$

$$5 \mid 2268 = \text{£}453\frac{3}{5} \text{ Ans.}$$

33. If 2 gills of Holland gin cost 8 pence, how many pounds will 1 hhd. cost?

$$\begin{array}{r}
 1 \\
 1 \quad 63 \quad 21 \\
 1 \quad 4 \\
 1 \quad 2 \\
 1 \quad 4 \\
 -2 \quad 8 \\
 -3 \quad 12 \quad 1 \\
 \hline
 5 \quad 20 \quad 1
 \end{array}$$

$$5 \mid 168 = \text{£}33\frac{3}{5} \text{ Ans.}$$

34. If 3 quarts of molasses cost 3 shillings, how many dollars, New York currency, will 12 hhds. cost?

$$\begin{array}{r}
 12 \quad 6 \\
 1 \quad 63 \\
 1 \quad 4 \\
 -3 \quad 9 \\
 -2 \quad 8 \quad 1 \\
 \hline
 \end{array}$$

$$| \$378 \text{ Ans.}$$

*Note.* In the above example, after we have received the price of 3 quarts, viz., 3 shillings, we then say that 8 shillings equal one dollar, New York currency; (see the table of the

pure proportion of the United States money;) or, if you please, you may state the question after this manner:

	12—	6
1	63	
1	4—	
—3	3—	
—4	20	1
—2		5—

| \$378 Ans.

*Note.* In the above, after we have gone on by reduction ascendant to pounds, we then say, £2 equal 5 dollars, which gives us the same answer.

35. If 2 gills of rum cost 3 farthings, how many dollars will 5 gallons cost, New Jersey currency? (See the table.)

	5—	
1	4—	
1	2—	
1	4—	
—2	3—	
—4	1	
—4	12	1
—4	20	1
3	8—	2

3 | 2 = \$1 Ans.

36. If 3 pints of port wine cost 9 pence, how many dollars, New England currency, will 3 hhds. cost? (See the table.)

	3—	
1	63	
1	4—	
1	2—	
—3	9—	3—
—4	12	1
—20		1
—3		1 0—

| \$63 Ans.

37. If 2 quarts of cider cost 1 shilling, how many dollars will 4 hds. cost, New York currency?

$$\begin{array}{r|rr}
 & 4 & 2 \\
 1 & 63 & \\
 1 & 4 & \\
 \hline
 -2 & 1 & \\
 \hline
 -2 & 8 & 1 \\
 \hline
 \end{array}$$

38. If 6 gills of wine cost 3 farthings, how many dollars, New England currency, will 12 hhds. cost?

		12
1		63-- 21
1		4--
1		2--
1		4-- 2
--2	6	3--
	4	1
	--12	1
--3	6	1
<hr/>		

39. If 4 quarts of vinegar cost 20 pence, how many pounds will 6 hhd. cost?

$$\begin{array}{r|l}
 & 6 \\
 1 & 63 \\
 1 & 4 \\
 \hline
 2 & 20 \\
 2 & 1 \\
 \hline
 2 & 1
 \end{array}$$

40. If 3 quarts of brandy cost 6 shillings, how many dollars, New York currency, will 2 tuns cost?

$$\begin{array}{r}
 & 2 \\
 1 & 2 \\
 1 & 2 \\
 1 & 2 \\
 1 & 63 & 21 \\
 1 & 4 \\
 \hline
 -3 & 6 \\
 \hline
 ---2 & ---8 & 1
 \end{array}$$

| \$504 Ans.

41. If 4 pounds of snuff cost 2 shillings, how many dollars, New York currency, will 8 cwt. cost?

$$\begin{array}{r}
 & 8 \\
 1 & 4 \\
 1 & 28 \\
 \hline
 -4 & 2 \\
 \hline
 ---8 & 1
 \end{array}$$

| \$56 Ans.

42. If 9 pounds of nails cost 6 shillings, how many dollars will 30 tons cost, New York currency?

$$\begin{array}{r}
 & 30 & 10 \\
 1 & 20 \\
 1 & 4 \\
 1 & 28 \\
 \hline
 ---3 & 9 & 6 & 3 \\
 \hline
 -20 & 1 \\
 \hline
 ---2 & 5
 \end{array}$$

| \$5600 Ans.

43. If 8 gallons of wine cost 4 dollars, how many pounds will 15 pipes cost, New York currency?

$$\begin{array}{r}
 & 15 & 3 \\
 1 & 2 \\
 1 & 63 \\
 \hline
 ---4 & 8 & 4 \\
 \hline
 ---5 & 2
 \end{array}$$

| £378 Ans.

44. If 4 quarts of oats cost 16 pence, how many dollars will 60 bushels cost, New Jersey currency?

$$\begin{array}{r}
 60 \text{---} 3 \text{---} \\
 1 \text{---} 4 \text{---} \\
 1 \text{---} 8 \text{---} 2 \\
 \hline
 \text{---} 4 \text{---} 16 \\
 \text{---} 4 \text{---} 12 \text{---} 1 \\
 \text{---} 20 \text{---} 1 \\
 3 \text{---} 8 \\
 \hline
 \end{array}$$

$$8 \mid 256 = \$85 \frac{1}{2} \text{ Ans.}$$

45. If 3 pecks of beans cost 7 pence, how many dollars will 9 bushels cost, South Carolina currency?

$$\begin{array}{r}
 9 \text{---} 3 \text{---} \\
 1 \text{---} 4 \text{---} \\
 \text{---} 3 \text{---} 7 \\
 \hline
 \text{---} 4 \text{---} 12 \text{---} 1 \\
 2 \text{---} 0 \text{---} 1 \\
 \text{---} 7 \text{---} 30 \text{---} \\
 \hline
 \end{array}$$

$$2 \mid 3 = \$1 \frac{1}{2} \text{ Ans.}$$

46. If 12 drams of opium cost 30 pence, how many dollars will 6 pounds cost, New York currency?

$$\begin{array}{r}
 6 \text{---} \\
 1 \text{---} 12 \text{---} \\
 1 \text{---} 8 \text{---} \\
 \text{---} 12 \text{---} 30 \text{---} 15 \\
 \text{---} 2 \text{---} 12 \text{---} 1 \\
 \text{---} 8 \text{---} 1 \\
 \hline
 \end{array}$$

$$1 \mid \$15 \text{ Ans.}$$

47. If 12 grains of silver be worth 1 shilling, what is the value of a silver tankard, weighing 4 pounds?

$$\begin{array}{r}
 4 \\
 1 \text{---} 12 \text{---} \\
 1 \text{---} 20 \text{---} \\
 1 \text{---} 24 \text{---} 8 \\
 \text{---} 12 \text{---} 1 \\
 \text{---} 20 \text{---} 1 \\
 \text{---} 3 \text{---} 8 \\
 \hline
 \end{array}$$

$$1 \mid \$256 \text{ Ans.}$$

*Note.* The method of proof is by inverting the question.  
Thus—proof of the last example :

		12---
---3	---24	1
---20		1
---12		1
---4	256	64--- 8---
---8		3---
1	20	---

| 1 shilling. *Ans.*

*Note.* When one or nothing remains, one is the answer in all cases.

48. Bought a piece of cloth for £16 $\frac{1}{4}$ , at 15 shillings per yard ; how many yards did it contain ?

	1	
---2	33	11
1	20	4--- 2
---3	15	1

| 22 yds. *Ans.*

49. If  $1\frac{1}{4}$  yards of cloth cost  $2\frac{1}{4}$  dollars, how many cents cost  $\frac{1}{4}$  quarter of a yard ?

	3---	
---4	1	
---3	2---	
2	5	
1	100	25

| 125 =  $62\frac{1}{2}$  cts. *Ans.*

50. If  $\frac{1}{3}$  of a yard cost  $\frac{3}{10}$  of a dollar, how many cents cost  $\frac{1}{15}$  of a yard ?

	7	
---2	3	
1 0---	3	
1	100	2---

| 21 cts. *Ans.*

51. When  $19\frac{1}{2}$  pounds of sugar cost  $\frac{9}{10}$  of a £, how many pounds can I have for  $\frac{5}{8}$  of a shilling?

$$\begin{array}{r}
 -8 \quad | \quad 5 \\
 -20 \quad | \quad 1 \\
 3 \quad | \quad 10 \\
 -5 \quad | \quad 96 \quad 12 \quad 6 \quad 2 \\
 \hline
 3 \quad | \quad 2 = \frac{2}{3} \text{ lb. Ans.}
 \end{array}$$

52. If  $8\frac{1}{2}$  of a lb. of starch cost  $\frac{3}{8}$  of a £, how many pounds of starch can I have for 72 cents, New Jersey currency?

$$\begin{array}{r}
 72 \quad 24 \quad 6 \\
 -4 \quad | \quad 100 \quad 1 \\
 -8 \quad | \quad 3 \\
 -3 \quad | \quad 8 \\
 -3 \quad | \quad 25 \\
 \hline
 | \quad 6 \text{ lbs. Ans.}
 \end{array}$$

53. If  $\frac{3}{4}$  of a yard of cloth be worth  $\frac{4}{3}$  of two dollars and 28 cents, what is the value of 7 yards?

$$\begin{array}{r}
 7 \\
 3 \quad | \quad 5 \\
 -3 \quad | \quad 2 \\
 \hline
 228 \quad 76
 \end{array}$$

$$3 \quad | \quad 5320 = \$17,73\frac{1}{3} \text{ cts. Ans.}$$

54. If  $\frac{1}{2}$  of a yard of cloth,  $\frac{3}{4}$  wide, cost  $2\frac{1}{4}$  dollars, what is the value of  $2\frac{1}{2}$  yards,  $1\frac{1}{2}$  wide.

$$\begin{array}{r}
 -2 \quad | \quad 5 \\
 2 \quad | \quad 3 \\
 1 \quad | \quad 2 \\
 -3 \quad | \quad 4 \\
 -4 \quad | \quad 9 \\
 \hline
 2 \quad | \quad 45 = \$22\frac{1}{2} \text{ Ans.}
 \end{array}$$

55. If  $\frac{3}{4}$  of  $\frac{1}{3}$  of the cargo of a ship be worth 250 dollars, what is the value of the whole cargo?

$$\begin{array}{r} 1 \\ 3 \mid 4 \\ 1 \mid 4 \\ \hline 250 \end{array}$$

$$3 \mid 4000 = \$1333\frac{1}{3} \text{ Ans.}$$

56. If 4 pounds of nails cost 18 pence, how many dollars will 12 tons cost, New York currency?

$$\begin{array}{r} 1 \mid 12 \\ 1 \mid 20 \quad 5 \\ 1 \mid 4 \\ \hline 28 \\ -4 \mid 18 \quad 9 \\ -12 \mid 1 \\ -2 \quad 8 \mid 1 \end{array}$$

$$| \quad \$1260 \text{ Ans.}$$

57. If  $\frac{2}{3}$  of  $\frac{4}{5}$  of  $\frac{7}{8}$  of a ship be worth  $\frac{1}{2}$  of  $\frac{8}{13}$  of the cargo valued at 12000 dollars, what did both ship and cargo stand the owner in?

$$\begin{array}{r} -12000 \quad 4 \\ -3 \mid 7 \\ -4 \mid 5 \\ -7 \mid 8 \quad 2 \\ 3 \mid 9 \quad 1 \\ 7 \mid 6 \quad 2 \\ 13 \mid 11 \end{array}$$

$$\begin{array}{r} 273 \mid 880000 = \$3223\frac{1}{3} \\ \text{or, } \$3223,44\frac{4}{7}\frac{1}{3} \text{ cts.} \\ \hline \$12000 \end{array}$$

$$| \quad \$15223,44\frac{6}{7}\frac{1}{3} \text{ cts. Ans.}$$

58. If  $\frac{4}{5}$  of  $\frac{5}{6}$  of  $\frac{7}{8}$  of  $\frac{1}{2}$  of a ship be worth  $\frac{7}{10}$  of  $\frac{3}{4}$  of  $\frac{4}{5}$  of  $\frac{8}{9}$  of the cargo valued at \$15000, what did both ship and cargo stand the owner in ?

$$\begin{array}{r|l}
 & -15\ 000\ 3- \\
 \hline
 -4 & 5- \\
 -5 & 8 \\
 -6 & 7- \\
 -7 & 12- 2- \\
 \hline
 -5 -10 & 7- \\
 -7 & 3- \\
 -8 & 4- \\
 \hline
 -3 -9 & 8- \\
 \hline
 & | 8000 \\
 & 15000
 \end{array}$$

\$23000 *Ans.*

*Note.* For the inverse pure proportion or proportion, observe only that the two equal denominations are changed, and the demand is laid upon the changed or inverted: then proceed, as taught in pure proportion, to the answer required.

59. If 12 men build a house in 48 days, in what time could 36 men build it ?

$$\begin{array}{r|l}
 & 12- \\
 \hline
 -3 -36 & 48- 16 \\
 \hline
 & | 16 \text{ } Ans.
 \end{array}$$

60. Admit that I lend a friend on his occasion 100 dollars for six months, and he promised me the like kindness when I desired it; but, when I come to request it, he could lend me only 75 dollars. The question is, how long must I keep the 75 dollars to recompense my courtesy to him ?

After the direct pure proportion, the demand would be laid upon 75 dollars; but we invert or change, and lay the demand upon the 100.

$$\begin{array}{r|l}
 & 100- 4 \\
 \hline
 -3 -75 & 6- 2 \\
 \hline
 & | 8 \text{ mo. } Ans.
 \end{array}$$

61. If I lend my friend 100 dollars for 6 months, allowing the month to be 30 days, how many days ought he to lend me 1000 dollars ?

$$\begin{array}{r} 100 \\ \hline 1000 \\ \hline 1 \quad 3 \ 0 \end{array}$$

| 18 days. Ans.

62. If, for 48 shillings, 225 cwt. be carried 512 miles, how many cwt. may be carried 64 miles for the same money ?

$$\begin{array}{r} 512 \quad 8 \\ \hline 64 \\ \hline 225 \end{array}$$

| 1800 cwt. Ans.

63. If, when wheat is 83 cents per bushel, the cent loaf weighs 9 oz., what ought it to weigh when wheat is 1 dollar  $24\frac{1}{2}$  cents per bushel ?

$$\begin{array}{r} 83 \\ \hline 3 \quad 249 \\ \hline 2 \\ \hline 9 \quad 3 \end{array}$$

| 6 oz. Ans.

64. There is a cistern having a cock which will empty it in 12 hours ; how many cocks of the same capacity will empty it in  $\frac{1}{4}$  of an hour ?

$$\begin{array}{r} 12 \\ \hline 1 \quad 4 \\ \hline 1 \\ \hline 48 \end{array}$$

Ans.

*Note.* It has been stated that the rule of pure proportion embraces all rules in general ; as reduction, tare and tret, loss and gain, barter, interest, single and compound fellowship, rule of three, (direct and inverse,) commission, brokerage, insurance, &c., &c., &c. And it is absolutely necessary that the scholar make himself acquainted with the rules and remarks laid down in the forepart of this work, in order that he may understand the following rules and examples : "To distinguish between direct and inverse proportion." If the "ef-

fect of the cause" is required, the question is direct; but if the question is a position (i. e., some part or element or constituent) of the cause, the question is inverse; and in this case all positions of the cause change places over the line: after which, the statement, as in other cases, is reduced by cancellation to the lowest term or answer required. Causes are men, horses, time, years, days, hours, capital, or sum, &c., &c. The effect is that which is produced by the causes; as, the work done, or money for the work, distance performed, &c. Proper attention and practice enables the learner to apply the criterion with accuracy and facility. Thus it will be seen, that interest belongs to the double rule of three; it can only require one of three different answers, that is, in some cases, interest; (i. e., the effect); and, in others, the sum, or capital, or time, which are causes. Observe, the effect never changes place, neither the answer required. You will observe, also, that we have five terms given to find the sixth, three of which are a supposition; the remaining two are a demand. The terms of demand take their appropriate place on the right side of the line under each other, and those of the same name in the supposition directly opposite on the left side of the line, and for which the answer is required takes the last place on the right side.

65. If 10 bushels of oats be sufficient for 18 horses 20 days, how many bushels will serve 60 horses 36 days?

$$\begin{array}{r|l} \text{---} 18 & 60 \\ \text{---} 20 & 36 \dots 18 \dots \\ & 1 0 \dots \end{array}$$

| 60 Ans.

*Note.* In the last example it is required to know how many bushels will serve the horses, consequently the effect of the cause is required; therefore, the question is direct. Had it been required to know how many horses would have consumed the oats, then the question would have been inverse.

66. If 7 men can reap 84 acres in 12 days, how many men will reap 100 acres in 5 days?

$$\begin{array}{r} -12 \quad -84 \\ -5 \quad | \quad 100 \quad -20 \\ \hline \quad | \quad 12 \\ \quad | \quad 7 \\ \hline \end{array}$$

| 20 Ans.

*Note.* In the above example 12 days and 5 days change places, they being the positions of the cause, for the reason that the cause is required; therefore, the question is inverse.

67. If 300 men, in six months, perform a piece of work when the days are 12 hours long, how many men will do the same in 4 months, when the days are 8 hours long?

$$\begin{array}{r} -4 \quad | \quad 6 \quad -3 \\ -4 \quad -8 \quad | \quad 12 \quad -3 \\ \hline \quad | \quad 300 \quad -75 \\ \hline \end{array}$$

| 675 Ans.

68. If the transportation of 12 cwt. 3 qrs. for 400 miles cost 57 dollars 12 cents, what will the transportation of 10 tons for 75 miles amount to?

$$\begin{array}{r} 1 \quad | \quad 1 \quad 0 \\ \quad | \quad 2 \quad 0 \\ -51 \quad | \quad 4 \\ -400 \quad | \quad 75 \\ \hline \quad | \quad 5712 \quad -112 \\ \hline \end{array}$$

| \$168.00 cts. Ans.

69. An usurer put out 150 dollars at interest; and when it had been on interest 8 months, he received for principal and interest 160 dollars; at what rate per cent. per annum did he receive interest?

$$\begin{array}{r} 160 \\ 150 \\ \hline 10 \\ \\ -3 \quad -150 \quad | \quad 10 \quad -2 \\ -2 \quad -8 \quad | \quad 12 \quad -4 \\ \hline \quad | \quad 10 \quad 0 \\ \hline \end{array}$$

| 10 per cent. Ans.

70. If 8 men can build a wall 20 feet long, 6 feet high, and 4 feet thick in 12 days, in what time will 24 men build one 200 feet long, 8 feet high, 6 feet thick?

$$\begin{array}{r}
 \begin{array}{r}
 \overline{-20} \\
 \begin{array}{r}
 \overline{-6} \\
 \begin{array}{r}
 \overline{-4} \\
 \begin{array}{r}
 \overline{-3} \quad \overline{-24} \\
 \hline
 \end{array}
 \end{array}
 \end{array}
 \end{array}
 \begin{array}{r}
 20 \ 0 \\
 8 \ 4 \\
 6 \\
 8 \\
 \hline
 12 \ 4 \\
 \hline
 \end{array}
 \end{array}$$

| 80 Ans.

71. Suppose 12 men consume 240 pounds of bread in eight days, how many men will consume 360 pounds in one day?

$$\begin{array}{r}
 \begin{array}{r}
 \overline{-2} \ \overline{-24} \ 0 \\
 \begin{array}{r}
 \overline{1} \\
 \hline
 \end{array}
 \end{array}
 \end{array}
 \begin{array}{r}
 36 \ 0 \\
 8 \ 4 \\
 12 \\
 \hline
 \end{array}
 \end{array}$$

| 144 Ans.

72. How many men can complete a trench of 135 yards long in 8 days, when 16 men can dig 54 yards in 6 days?

$$\begin{array}{r}
 \begin{array}{r}
 \overline{-9} \ \overline{-54} \\
 \begin{array}{r}
 \overline{-8} \\
 \hline
 \end{array}
 \end{array}
 \end{array}
 \begin{array}{r}
 135 \ 15 \\
 6 \\
 16 \ 2 \\
 \hline
 \end{array}
 \end{array}$$

| 30 Ans.

73. If 16 bushels of oats serve 9 horses 6 days, how many bushels would 27 horses consume in 11 days?

$$\begin{array}{r}
 \begin{array}{r}
 \overline{-9} \\
 \begin{array}{r}
 \overline{-2} \ \overline{-6} \\
 \hline
 \end{array}
 \end{array}
 \end{array}
 \begin{array}{r}
 27 \ 3 \\
 11 \\
 16 \ 8 \\
 \hline
 \end{array}
 \end{array}$$

| 88 Ans.

74. If a footman travels from New York to Boston, which is 250 miles, in 8 days, when the days are 12 hours long, in how many days may he travel from New York to Charleston,

South Carolina, which is 925 miles, when the days are 16 hours long?

$$\begin{array}{r}
 5 \text{ ---} 10 \text{ ---} 250 \mid 925 \text{ ---} 37 \\
 \text{---} 2 \text{ ---} 16 \mid 12 \text{ ---} 6 \text{ ---} 3 \\
 \text{---} \text{---} \text{---} \mid 8 \text{ ---} \\
 \hline
 5 \mid 111 = 22\frac{1}{5} \text{ Ans.}
 \end{array}$$

75. If 2 horses consume as much corn as 5 oxen, and 12 horses consume 56 bushels in 20 days, how many bushels will 18 oxen consume in 25 days?

$$\begin{array}{r}
 \text{---} 5 \mid 18 \text{ ---} 3 \\
 \text{---} 4 \text{ ---} 20 \mid 25 \text{ ---} 5 \text{ ---} \\
 \text{---} 6 \text{ ---} 12 \mid 2 \text{ ---} \\
 \text{---} \text{---} \text{---} \mid 56 \text{ ---} 14 \\
 \hline
 \mid 42 \text{ Ans.}
 \end{array}$$

76. If 2 barrels of beer be sufficient to last a family of 14 persons 24 days, how many barrels will be drunk out by a family of 24 persons in one year?

$$\begin{array}{r}
 7 \text{ ---} 14 \mid 24 \text{ ---} \\
 \text{---} 24 \mid 365 \\
 \text{---} \text{---} \mid 2 \text{ ---} \\
 \hline
 7 \mid 365 = 52\frac{1}{7} \text{ Ans.}
 \end{array}$$

77. If 248 men, in 5 days, of 11 hours each, can dig a trench 230 yards long, 3 wide, and 2 deep, in how many days, of 9 hours each, will 24 men dig a trench 420 yards long, 5 wide, and 3 deep?

$$\begin{array}{r}
 \text{---} 6 \text{ ---} 24 \mid 248 \text{ ---} 62 \text{ ---} 31 \\
 \text{---} 9 \mid 11 \\
 23 \text{ } 0 \text{ ---} \mid 420 \text{ ---} 7 \\
 \text{---} 3 \mid 5 \\
 \text{---} 2 \mid 3 \text{ ---} \\
 \text{---} \text{---} \mid 5 \\
 \hline
 207 \mid 59675 = 288\frac{59}{207} \text{ Ans.}
 \end{array}$$

78. If 56 pounds of bread be sufficient for 7 men 14 days, how much bread will serve 21 men 3 days?

$$\begin{array}{r} -7 \mid 21 \quad 3 \\ -14 \mid 3 \\ \hline 56 \mid 4 \end{array}$$

| 36 *Ans.*

79. If 4 reapers receive \$11,04 cts. for 3 days' work, how many men may be hired 16 days for \$103,04 cts.?

$$\begin{array}{r} -368 \quad -1104 \mid 10304 \quad 2576 \quad 7 \\ -4 \quad -16 \mid 3 \\ \hline 4 \end{array}$$

| 7 *Ans.*

80. If 20 bushels of wheat are sufficient for a family of 8 persons 5 months, how much will be sufficient for 4 persons 12 months?

$$\begin{array}{r} -2 \quad -8 \mid 4 \\ -5 \mid 12 \quad 6 \\ \hline 20 \mid 4 \end{array}$$

| 24 *Ans.*

81. If 30 men perform a piece of work in 20 days, how many men will accomplish another piece of work 4 times as large, in a fifth part of the time?

$$\begin{array}{r} 1 \mid 20 \\ -4 \mid 4 \\ \hline 30 \end{array}$$

| 600 *Ans.*

82. If 7 men can build 36 rods of wall in 3 days, how many rods can 20 men build in 14 days?

$$\begin{array}{r} -7 \mid 20 \\ -14 \mid 2 \\ -3 \mid 36 \quad 12 \\ \hline \end{array}$$

| 480 *Ans.*

83. If 40 men, in 10 days, can reap 200 acres of grain, how many acres can 14 men reap in 24 days?

$$\begin{array}{r} -40 \mid 14 \\ 10 \mid 24 \quad 6 \\ \hline 200 \end{array}$$

| 168 *Ans.*

84. If 4 men mow 96 acres of grass in 12 days, how many acres can 8 men mow in 16 days?

$$\begin{array}{r} \overline{-4} \bigg| \begin{array}{r} 8 \\ 16 \\ 96-8-2 \\ \hline 256 \end{array} \\ \overline{-12} \end{array} \quad | \quad 256 \quad \text{Ans.}$$

85. If a family of 8 persons, in 24 months, spend 480 dollars, how much would 16 persons spend in 8 months?

$$\begin{array}{r} \overline{-8} \bigg| \begin{array}{r} 16 \\ 8- \\ 480-20 \\ \hline \end{array} \\ \overline{-24} \end{array} \quad | \quad \$320 \quad \text{Ans.}$$

86. If 7 quarts of malt are sufficient for a family of 7 persons for 4 months, how many quarts are enough for 46 persons 10 months?

$$\begin{array}{r} \overline{-7} \bigg| \begin{array}{r} 46-23 \\ 10-5 \\ 7- \\ \hline 115 \end{array} \\ \overline{-2} \quad \overline{-4} \end{array} \quad | \quad 115 \quad \text{Ans.}$$

87. If 8 reapers have £3 $\frac{1}{2}$  for 4 days' work, how much will 48 men have for 16 days' work?

$$\begin{array}{r} \overline{-8} \bigg| \begin{array}{r} 48-6 \\ 16-4 \\ 16 \\ \hline \end{array} \\ \overline{-4} \quad \overline{5} \\ \hline 5 \end{array} \quad | \quad 384=76\frac{1}{2} \quad \text{Ans.}$$

88. If a footman travels 240 miles in 12 days, when the days are 12 hours long, how many days may he travel 720 miles in, of 16 hours long?

$$\begin{array}{r} \overline{-240} \bigg| \begin{array}{r} 720-3 \\ 12-3 \\ 12-3 \\ \hline 27 \end{array} \\ \overline{-4} \quad \overline{-16} \end{array} \quad | \quad 27 \quad \text{Ans.}$$

89. If 9 students spend in 18 days £10 $\frac{7}{8}$ , how many dollars, New Jersey currency, will 63 students spend in 30 days?

$$\begin{array}{r}
 \begin{array}{c}
 -9 \\
 -18 \\
 -7 \\
 -3
 \end{array}
 \left| \begin{array}{r}
 63 \\
 30 \\
 72 \\
 8
 \end{array} \right. \\
 \hline
 \begin{array}{c}
 7 \\
 10 \\
 4 \\
 8
 \end{array}
 \end{array}$$

| 320 *Ans.*

90. If 30 shillings be the hire of 8 men for 3 days, how many days must 20 men work for £15?

$$\begin{array}{r}
 \begin{array}{c}
 -20 \\
 1 \\
 -2
 \end{array}
 \left| \begin{array}{r}
 8 \\
 15 \\
 20 \\
 3
 \end{array} \right. \\
 \hline
 \begin{array}{c}
 4 \\
 3 \\
 20 \\
 3
 \end{array}
 \end{array}$$

| 12 *Ans.*

91. If 4 reapers have 24 shillings for 3 days' work, how many men will earn £4 $\frac{1}{2}$  in 16 days?

$$\begin{array}{r}
 \begin{array}{c}
 -5 \\
 1 \\
 -24 \\
 -4
 \end{array}
 \left| \begin{array}{r}
 24 \\
 20 \\
 3 \\
 4
 \end{array} \right. \\
 \hline
 \begin{array}{c}
 4 \\
 3 \\
 16 \\
 4
 \end{array}
 \end{array}$$

| 3 *Ans.*

92. If 9 men reap 18 acres in 3 days, how many acres will 27 men reap in 6 days?

$$\begin{array}{r}
 \begin{array}{c}
 -9 \\
 -3
 \end{array}
 \left| \begin{array}{r}
 27 \\
 6
 \end{array} \right. \\
 \hline
 \begin{array}{c}
 3 \\
 18
 \end{array}
 \end{array}$$

| 108 *Ans.*

93. Require the interest of 12 dollars for 8 months, at 6 per cent.

$$\begin{array}{r}
 \begin{array}{c}
 1 \\
 -12
 \end{array}
 \left| \begin{array}{r}
 12 \\
 8 \\
 6
 \end{array} \right. \\
 \hline
 \begin{array}{c}
 12 \\
 8 \\
 6
 \end{array}
 \end{array}$$

| 48 *cts. Ans.*

*Note.* The above example reads thus: If 1 dollar in 12 months gain 6 cents interest, what will 12 dollars in 8 months gain? The time expressed on the left of the line is always one year, either in months or days.

94. What is the interest of 40 dollars for 16 months, at 6 per cent.?

$$\begin{array}{r}
 1 \mid 40 \\
 -3 -12 \mid 16 - 4 \\
 \hline
 6 - 2 \\
 \hline
 \mid \$3,20 \text{ cts. } \text{Ans.}
 \end{array}$$

95. What is the interest of 10 dollars for  $1\frac{1}{2}$  years, or 18 months, at 6 per cent.?

$$\begin{array}{r}
 1 \mid 10 \\
 -2 -12 \mid 18 - 9 \\
 \hline
 6 - \\
 \hline
 \mid 90 \text{ cts. } \text{Ans.}
 \end{array}$$

96. What is the interest of 8 dollars for 4 months, at 6 per cent.?

$$\begin{array}{r}
 1 \mid 8 \\
 -3 -12 \mid 4 - \\
 \hline
 6 - 2 \\
 \hline
 \mid 16 \text{ cts. } \text{Ans.}
 \end{array}$$

97. What is the interest of 4 dollars for 4 months, at 6 per cent.?

$$\begin{array}{r}
 1 \mid 4 \\
 -3 -12 \mid 4 - \\
 \hline
 6 - 2 \\
 \hline
 \mid 8 \text{ cts. } \text{Ans.}
 \end{array}$$

98. What is the interest of 2 dollars for 6 months, at 6 per cent.?

$$\begin{array}{r}
 1 \mid 2 - \\
 -2 -12 \mid 6 - \\
 \hline
 6 - \\
 \hline
 \mid 6 \text{ cts. } \text{Ans}
 \end{array}$$

99. What is the interest of 20 dollars for 2 months, at 6 per cent.?

$$\begin{array}{r} 1 \mid 20 \\ -2 \quad -12 \\ \hline 2 \\ \hline 6 \end{array}$$

| 20 cts. *Ans.*

100. What is the interest of 80 dollars for 10 months, at 6 per cent.?

$$\begin{array}{r} 1 \ 00 \mid -8 \ 0 \ 4 \\ -2 \quad -12 \mid 1 \ 0 \ \ \ \ \\ \hline 6 \end{array}$$

| \$4 *Ans.*

101. What is the interest of 40 dollars for 12 months, at 6 per cent.?

$$\begin{array}{r} 1 \mid 40 \\ -12 \mid 12 \ \ \ \ \\ \hline 6 \end{array}$$

| \$2,40 cts. *Ans.*

102. What is the interest of 8 dollars for 1 year and 4 months, at 6 per cent.?

$$\begin{array}{r} 1 \mid 8 \\ -2 \quad -12 \mid 16 \ 8 \\ \hline 6 \end{array}$$

| 64 cts. *Ans.*

103. What is the interest of 5 dollars for one year and 6 months, at 6 per cent.?

$$\begin{array}{r} 1 \mid 5 \\ -2 \quad -12 \mid 18 \ 9 \\ \hline 6 \end{array}$$

| 45 cts. *Ans.*

104. What is the interest of 1 dollar for 4 years, at 6 per cent.?

$$\begin{array}{r} 1 \mid 1 \\ 1 \mid 4 \\ 1 \mid 6 \end{array}$$

| 24 cts. *Ans.*

105. What is the interest of £100 for 2 months, at 6 per cent.?

$$\begin{array}{r}
 \begin{array}{c|c}
 100 & \\
 \hline
 -6 & -12 \\
 \hline
 2 & \\
 \hline
 6
 \end{array}
 \\ \hline
 \begin{array}{c|c}
 & \text{£1} \\
 \hline
 & \text{Ans.}
 \end{array}
 \end{array}$$

106. What is the interest of £10 for 1 year and 8 months, at 6 per cent.?

$$\begin{array}{r}
 \begin{array}{c|c}
 100 & 10 \\
 \hline
 -2 & -12 \\
 \hline
 20 \\
 \hline
 6
 \end{array}
 \\ \hline
 \begin{array}{c|c}
 & \text{£1} \\
 \hline
 & \text{Ans.}
 \end{array}
 \end{array}$$

107. What is the interest of 2 dollars and 50 cents for 2 months, at 6 per cent.?

$$\begin{array}{r}
 \begin{array}{c|c}
 1 & 250 \\
 \hline
 -2 & -12 \\
 \hline
 2 \\
 \hline
 6
 \end{array}
 \\ \hline
 \begin{array}{c|c}
 & \text{2 cts. 5 mills.} \\
 \hline
 & \text{Ans.}
 \end{array}
 \end{array}$$

108. What is the interest of 6 dollars 50 cents for 2 months, at 6 per cent.?

$$\begin{array}{r}
 \begin{array}{c|c}
 1 & 650 \\
 \hline
 ---6 & ---12 \\
 \hline
 2 \\
 \hline
 6
 \end{array}
 \\ \hline
 \begin{array}{c|c}
 & \text{6\frac{1}{2} cts.} \\
 \hline
 & \text{Ans.}
 \end{array}
 \end{array}$$

109. What is the interest of 5 dollars for 73 days, at 5 per cent.?

$$\begin{array}{r}
 \begin{array}{c|c}
 1 & 5 \\
 \hline
 ---73 & ---365 \\
 \hline
 73 \\
 \hline
 5
 \end{array}
 \\ \hline
 \begin{array}{c|c}
 & \text{5 cts.} \\
 \hline
 & \text{Ans.}
 \end{array}
 \end{array}$$

110. What is the interest of 73 dollars for 60 days, at 5 per cent.?

$$\begin{array}{r}
 \begin{array}{c|c}
 1 & 73 \\
 \hline
 ---5 & ---365 \\
 \hline
 60 & 12 \\
 \hline
 7
 \end{array}
 \\ \hline
 \begin{array}{c|c}
 & \text{84 cts.} \\
 \hline
 & \text{Ans.}
 \end{array}
 \end{array}$$

111. If 25 men, by working 10 hours a day, can dig a trench 36 feet long, 12 feet broad, and 6 feet deep in 9 days, how many hours a day must 15 men work, in order to dig a trench 48 feet long, 8 feet broad, and 5 feet deep in 12 days?

$$\begin{array}{r}
 3 \quad 15 \quad | \quad 25 \\
 -4 \quad 36 \quad | \quad 48 \dots 4 \\
 \quad \quad \quad | \quad 12 \quad 8 \dots 2 \\
 3 \quad 6 \quad | \quad 5 \dots \\
 3 \quad 12 \quad | \quad 9 \dots \\
 \hline
 \quad \quad \quad | \quad 10 \\
 \hline
 27 \quad | \quad 250 = 9 \frac{7}{27} \quad \text{Ans.}
 \end{array}$$

112. If a man travels 60 miles in 5 days by travelling 3 hours each day, how far will he travel in 10 days by travelling 9 hours each day?

$$\begin{array}{r}
 -5 \quad | \quad 10 \dots 2 \\
 -3 \quad | \quad 9 \dots 3 \\
 \hline
 \quad \quad \quad | \quad 60 \\
 \hline
 \quad \quad \quad | \quad 360 \quad \text{Ans.}
 \end{array}$$

113. If 5 men can build 10 rods of wall in 6 days, how many rods can 20 men build in 18 days?

$$\begin{array}{r}
 -5 \quad | \quad 20 \dots 4 \\
 -6 \quad | \quad 18 \dots 3 \\
 \hline
 \quad \quad \quad | \quad 10 \\
 \hline
 \quad \quad \quad | \quad 120 \quad \text{Ans.}
 \end{array}$$

114. If 4 men receive 24 dollars for 6 days' work, how much will 8 men receive for 12 days' work?

$$\begin{array}{r}
 -4 \quad | \quad 8 \dots 2 \\
 -6 \quad | \quad 12 \dots 2 \\
 \hline
 \quad \quad \quad | \quad 24 \\
 \hline
 \quad \quad \quad | \quad \$96 \quad \text{Ans.}
 \end{array}$$

115. If 4 men receive 24 dollars for 6 days' work, how many men may be hired 12 days for 96 dollars?

$$\begin{array}{r}
 -3 \quad -12 \quad | \quad 6 \dots 2 \\
 -24 \quad | \quad 96 \dots 4 \dots \\
 \hline
 \quad \quad \quad | \quad 4 \\
 \hline
 \quad \quad \quad | \quad 8 \quad \text{Ans.} \\
 \quad \quad \quad | \quad \text{K}
 \end{array}$$

116. If 8 men, in 12 days, receive 96 dollars, how much will 4 men receive for 6 days' work?

$$\begin{array}{r|l} -8 & 4 \\ -12 & 6 \\ \hline 96 & 8 \dots \end{array}$$

| \$24 Ans.

117. If 8 men receive 96 dollars for 12 days' work, how long may 4 men be hired for 24 dollars?

$$\begin{array}{r|l} -4 & 8 \dots 2 \\ -4 \quad -96 & 24 \dots \\ \hline 12 & 3 \\ \hline 6 & \end{array}$$

Ans.

118. If 9 persons in a family spend 1512 dollars in one year, how much will 3 of the same family spend in 4 months?

$$\begin{array}{r|l} -9 & 3 \dots \\ -3 \quad -12 & 4 \dots \\ \hline 1512 & 168 \dots \\ \hline 168 & \end{array}$$

Ans.

119. If 2000 dollars will support a garrison of 150 men 3 months, how long will 6000 dollars support 4 times as many men?

$$\begin{array}{r|l} -2000 & 6000 \dots 3 \\ 4 \quad -600 & 150 \dots \\ \hline 3 & \\ \hline 4 & 9 = 2 \frac{1}{4} \end{array}$$

Ans.

120. If 144 men, in 6 days, of 12 hours each, dig a trench 200 feet long, 3 feet wide, and 2 feet deep, how many hours long is the day when 30 men dig a trench 350 feet long, 6 feet wide, and 3 feet deep in 250 $\frac{1}{2}$  days?

$$\begin{array}{r|l} -30 & 144 \dots \\ -39 \quad -1296 & 5 \dots \\ \hline 6 & 2 \dots \\ -2 \quad -8 \quad -40 \quad -200 & 350 \dots 7 \\ \hline -3 & 6 \dots 2 \dots \\ -2 & 3 \dots \\ \hline 12 & 4 \dots \\ \hline 7 & \end{array}$$

Ans.

121. There was a certain edifice completed in one year by 20 workmen ; but the same being demolished, it is necessary that just such an one should be built in 5 months : I demand the number of men to be employed about it ?

$$\begin{array}{r} 1 \\ -5 \\ \hline 20 \end{array} \left| \begin{array}{r} 1 \\ 12 \\ \hline 4 \end{array} \right.$$

| 48 *Ans.*

122. If 8 men spend 32 pounds in 13 weeks, what will 24 men spend in 52 weeks ?

$$\begin{array}{r} 8 \\ -13 \\ \hline 32 \end{array} \left| \begin{array}{r} 24 \dots 3 \\ 52 \dots 4 \\ \hline 32 \end{array} \right.$$

| £384 *Ans.*

123. A wall, to be raised to the height of 27 feet, was raised to the height of 9 feet by 12 men in 6 days ; how many men must be employed to finish it in 4 days ?

$$\begin{array}{r} 9 \\ -4 \\ \hline 12 \end{array} \left| \begin{array}{r} 18 \dots 2 \\ 6 \\ \hline 3 \end{array} \right.$$

| 36 *Ans.*

124. If 6 labourers dig a ditch 34 yards long in 10 days, how many yards will 20 labourers dig in 15 days ?

$$\begin{array}{r} 3 \quad 6 \\ 10 \\ \hline \end{array} \left| \begin{array}{r} 2 \quad 0 \dots \\ 15 \dots 5 \\ 34 \end{array} \right.$$

| 170 *Ans.*

125. If a garrison of 600 men have provisions for 5 weeks, allowing each man 12 oz. per day, how many men may be maintained 10 weeks with the same provisions, if each man is limited to 8 oz. per day ?

$$\begin{array}{r} 2 \quad 10 \\ 8 \\ \hline \end{array} \left| \begin{array}{r} 5 \dots \\ 12 \dots 6 \\ 600 \dots 75 \end{array} \right.$$

| 450 *Ans.*

126. If 3 bushels and 3 pecks of corn will last a family of 9 persons 22 days, in how many days will 6 persons consume 5 bushels?

$$\begin{array}{r}
 \begin{array}{r}
 -3 \quad -15 \\
 -2 \quad -6
 \end{array}
 \left| \begin{array}{r}
 5 \\
 4 \\
 9 \quad 3 \\
 22 \quad 11
 \end{array} \right. \\
 \hline
 \end{array}$$

| 44 *Ans.*

127. If 450 tiles, each 12 inches square, will pave my cellar, how many tiles must I have if they are only 9 inches long and 8 inches broad?

$$\begin{array}{r}
 \begin{array}{r}
 -9 \\
 -2 \quad -8
 \end{array}
 \left| \begin{array}{r}
 12 \quad 6 \\
 12 \quad 3 \\
 450 \quad 50
 \end{array} \right. \\
 \hline
 \end{array}$$

| 900 *Ans.*

128. If 12 ounces of wool make  $2\frac{1}{2}$  yards of cloth 6 quarters wide, how much wool is required for 150 yards 4 quarters wide?

$$\begin{array}{r}
 \begin{array}{r}
 -5 \\
 -6 \\
 -2 \quad -4 \quad -16
 \end{array}
 \left| \begin{array}{r}
 150 \quad 30 \\
 2 \\
 12 \quad 2 \\
 1
 \end{array} \right. \\
 \hline
 \end{array}$$

| 30 *lbs. Ans.*

129. If a bar of iron 4 feet long, 3 inches broad, and  $1\frac{1}{2}$  inches thick weighs 36 lbs., what will a bar weigh that is 6 feet long, 4 inches broad, and 2 inches thick?

$$\begin{array}{r}
 \begin{array}{r}
 -4 \\
 -3 \\
 -3
 \end{array}
 \left| \begin{array}{r}
 1 \\
 6 \quad 2 \\
 4 \\
 2 \\
 36 \quad 12 \\
 2
 \end{array} \right. \\
 \hline
 \end{array}$$

| 96 *Ans.*

130. If 14 men can reap 84 acres in 3 days, how many men will reap 44 acres in 4 days?

$$\begin{array}{r}
 \begin{array}{r} \text{---} 6 & \text{---} 84 \\ & \text{---} 4 \end{array} \bigg| \begin{array}{r} 44 \text{---} & 11 \\ 6 \text{---} & \\ 14 \text{---} & \end{array} \\
 \hline
 & \begin{array}{r} 11 & \text{Ans.} \end{array}
 \end{array}$$

111 Ans.

131. If a cistern  $17\frac{1}{2}$  feet in length,  $10\frac{1}{2}$  in breadth, and 13 feet deep, holds 546 barrels of water, how many barrels will fill a cistern that is 16 feet long, 7 feet broad, and 15 feet deep?

$$\begin{array}{r|rr}
 & 16 \\
 \hline
 -5 & -35 & 2 \\
 & & 7 \\
 \hline
 -7 & -21 & 2 \\
 & -13 & 15 \quad 3 \\
 & & 546 \quad 78 \quad 6
 \end{array}$$

384 *Ans.*

132. If 25 pears can be bought for 10 lemons, and 28 lemons for 18 pomegranates, and 1 pomegranate for 48 almonds, and 50 almonds for 70 chestnuts, and 108 chestnuts for 2½ cents, how many pears can I buy for \$1,35 cts. ?

$$\begin{array}{r|rr}
 2 & -10 & 25 - 5 - \\
 & -18 & 28 - 4 - \\
 \hline
 -2 & -8 & -48 \\
 & -7 & 0 \\
 \hline
 & -5 & 2 \\
 \hline
 & & 135
 \end{array}$$

$$2 \mid 675 - 337 \} \text{ Ans.}$$

133. If the interest on 347 dollars for  $3\frac{1}{2}$  years be 72 dollars 87 cents, what will be the interest, at the same rate, on 537 dollars for  $2\frac{1}{4}$  years?

$$\begin{array}{r|r}
 -347 & 537 \\
 -2 & 5 \\
 -7 & 2 \\
 \hline
 7287 & 1041 \quad 3
 \end{array}$$

18055 Ans.

K 2

134. What must be paid for the carriage of 4 cwt. 32 miles, if the carriage of 8 cwt. 128 miles cost 12 dollars 80 cents?

$$\begin{array}{r} -8 \quad | \quad 4 \\ -128 \quad | \quad 32 \quad 4 \\ \hline -128 \quad 0 \\ | \quad \$160 \text{ Ans.} \end{array}$$

135. By working 9 hours a day, 5 men hoed 18 acres of corn in 4 days; how many acres will 9 men hoe at that rate in 3 days, working 10 hours a day?

$$\begin{array}{r} -5 \quad | \quad 9 \\ -2 \quad -4 \quad | \quad 3 \\ -9 \quad | \quad 10 \quad 2 \\ \hline 18 \quad 2 \\ | \quad 27 \text{ Ans.} \end{array}$$

136. One pound of thread makes 2 yards of linen cloth, 5 quarters wide; how many pounds of thread will be required to make 50 yards, 3 quarters wide?

$$\begin{array}{r} -2 \quad | \quad 50 \quad 10 \quad 5 \\ -5 \quad | \quad 3 \\ \hline 1 \\ | \quad 15 \text{ Ans.} \end{array}$$

137. If 6 men, working 7 hours a day, mowed 28 acres of grass in 4 days, how many men at that rate will mow 16 acres in 8 days, working 6 hours a day?

$$\begin{array}{r} -7 \quad -28 \quad | \quad 16 \quad 2 \\ -8 \quad | \quad 4 \\ -6 \quad | \quad 7 \\ \hline 6 \\ | \quad 2 \text{ Ans.} \end{array}$$

138. If 5 men can make 300 pairs of boots in 40 days, how many men must be employed to make 900 pairs in 60 days?

$$\begin{array}{r} -300 \quad | \quad 900 \quad 3 \\ -2 \quad -60 \quad | \quad 40 \quad 2 \\ \hline 5 \\ | \quad 10 \text{ Ans.} \end{array}$$

139. If 3 compositors set  $15\frac{1}{4}$  pages in  $2\frac{7}{9}$  days, how many will be required to set  $69\frac{3}{4}$  pages in  $6\frac{1}{4}$  days?

$$\begin{array}{r}
 \begin{array}{c|cc}
 -4 & 279 & 31 \\
 -31 & 2 & \\
 -25 & 4 & \\
 -9 & 25 & \\
 \hline
 & 3 & \\
 \end{array} \\
 | \quad 6 \text{ Ans.}
 \end{array}$$

140. What is the interest of 18 dollars for 8 months and 10 days, at 6 per cent.?

$$\begin{array}{r}
 \begin{array}{c|cc}
 1 & 18 & 6 \\
 -3 & 25 & \\
 -2 & 12 & 6 \quad 3 \\
 \hline
 & & \\
 \end{array} \\
 | \quad 75 \text{ cts. Ans.}
 \end{array}$$

141. What is the interest of \$14,60 cts. for 80 days, at 5 per cent.?

$$\begin{array}{r}
 \begin{array}{c|cc}
 -5 & -25 & -100 \\
 -365 & 80 & 16 \\
 \hline
 & 5 & \\
 \end{array} \\
 | \quad 16 \text{ cts. Ans.}
 \end{array}$$

142. If 100 pounds English make 95 pounds Flemish, and 19 pounds Flemish make 25 pounds at Bolonia, how many pounds English are equal to 50 pounds at Bolonia?

$$\begin{array}{r}
 \begin{array}{c|cc}
 -5 & -95 & 100 \quad 20 \\
 -25 & 19 & \\
 \hline
 & 50 & 2 \\
 \end{array} \\
 | \quad 40 \text{ Ans.}
 \end{array}$$

143. If 6 braces at Leghorn make 3 ells English, 5 ells English make 9 braces at Venice, how many braces at Leghorn will be equal to 90 braces at Venice?

$$\begin{array}{r}
 \begin{array}{c|cc}
 -3 & 6 & 2 \\
 -9 & 5 & \\
 \hline
 & 9 & 0 \\
 \end{array} \\
 | \quad 100 \text{ Ans.}
 \end{array}$$

144. If 3 dozen pairs of gloves be equal in value to 2 pieces of Holland, 3 pieces of Holland to 7 yards of satin, 6 yards of satin to 2 pieces of Flanders lace, and 3 pieces Flanders lace to 81 shillings, how many dozen pairs of gloves may be bought for 28 shillings ?

---2	3---
---7	3---
---2	6--- 2---
---3	3---
---9	28--- 4--- 2
---27	
---81	

145. If 24 pounds at New London make 20 pounds at Amsterdam, 50 pounds at Amsterdam make 60 pounds at Paris, how many pounds at Paris are equal to 40 pounds at New London?

$$\begin{array}{r}
 \underline{-20} \quad | \quad 24 \dots \quad 4 \\
 \underline{-60} \quad | \quad 5 \ 0 \dots \\
 \hline
 \quad \quad \quad | \quad 40 \dots \quad 2 \\
 \hline
 \quad \quad \quad | \quad 40 \quad \text{Ans.}
 \end{array}$$

146. If 40 pounds at New York make 48 pounds at Antwerp, and 30 pounds at Antwerp make 36 pounds at Leghorn, how many pounds at New York are equal to 144 pounds at Leghorn?

$$\begin{array}{r}
 \begin{array}{r} \text{---} 4 \end{array} \begin{array}{r} \text{---} 12 \end{array} \begin{array}{r} \text{---} 48 \end{array} \begin{array}{r} \text{---} 40 \end{array} \\
 \begin{array}{r} \text{---} 36 \end{array} \begin{array}{r} \text{---} 30 \end{array} \\
 \hline
 \begin{array}{r} 144 \end{array} \begin{array}{r} \text{---} 4 \end{array}
 \end{array}$$

147. If 20 braces at Leghorn be equal to 11 vares at Lisbon, and 40 vares at Lisbon to 80 braces at Lucca, how many braces at Lucca are equal to 100 braces at Leghorn?

---20 | 11  
---40 | 80---2---  
| 10 0---

110 *Ans.*

148. If 17 pounds of raisins are worth 20 pounds of almonds, and 5 pounds of almonds worth  $8\frac{1}{2}$  pounds of figs, and  $37\frac{1}{2}$  pounds of figs worth 30 pounds of tamarinds, how many

pounds of tamarinds are equal in value to  $42\frac{1}{2}$  pounds of raisins?

$$\begin{array}{r}
 \begin{array}{r}
 ---17 & 20--- 2 \\
 ---5 & 17--- \\
 ---2 & 2--- \\
 \hline
 \end{array} \\
 \begin{array}{r}
 ---5 ---15 ---75 & 30--- 6--- 2 \\
 \hline
 ---2 & 85--- 17
 \end{array}
 \end{array}$$

| 68 Ans.

149. Suppose 100 pounds of Venice weight is equal to 70 pounds of Lyons, and 60 pounds of Lyons to 50 pounds of Rouen, and 20 pounds of Rouen to 25 pounds of Toulouse, and 50 pounds of Toulouse to 37 pounds of Geneva, how many pounds of Geneva are equal to 25 pounds of Venice?

$$\begin{array}{r}
 \begin{array}{r}
 4 ---100 & 7 0--- \\
 6 0--- & 50--- \\
 \hline
 \end{array} \\
 \begin{array}{r}
 4 ---20 & 25--- 5 \\
 ---50 & 37 \\
 \hline
 25---
 \end{array}
 \end{array}$$

| 96 | 1295 = 1347 Ans.

150. If one French crown is equal in value to 80 pence of Holland, and 83 pence of Holland to 48 pence English, and 40 pence English to 70 pence of Hamburgh, and 64 pence of Hamburgh to 1 florin of Frankfort, how many florins of Frankfort are equal to 166 French crowns?

$$\begin{array}{r}
 \begin{array}{r}
 1 & 80--- 2--- \\
 ---83 & 48--- 6--- 3 \\
 ---40 & 70 \\
 \hline
 \end{array} \\
 \begin{array}{r}
 ---2 ---4 ---8 ---64 & 1 \\
 \hline
 166--- 2---
 \end{array}
 \end{array}$$

| 210 Ans.

151. If A can do as much work in 3 days as B can do in  $4\frac{1}{2}$  days, and B as much in 9 days as C in 12 days, and C as much in 10 days as D in 8 days, how many days' work of D are equal to 5 days' work of A?

$$\begin{array}{r}
 \begin{array}{r}
 ---3 & 9--- \\
 ---2 & 12--- 4--- 2--- \\
 ---9 & 8 \\
 \hline
 \end{array} \\
 \begin{array}{r}
 ---2 ---10 & 5--- \\
 \hline
 \end{array}
 \end{array}$$

| 8 Ans

152. If 70 braces at Venice are equal to 75 braces at Leghorn, and 7 braces at Leghorn are equal to 4 yards of the United States, how many braces at Venice are equal to 64 yards in the United States?

$$\begin{array}{r} 15 \text{ --- } 75 \\ \text{--- } 4 \text{ } \mid \text{ } 7 \\ \hline 64 \text{ --- } 16 \end{array}$$

$$15 \mid 1568 = 104\frac{8}{15} \text{ Ans.}$$

153. A merchant in St. Petersburg owes 1000 ducats in Berlin, which he wishes to pay in rubles by the way of Holland; and he has for the data of his operation the following information, viz., that one ruble gives  $47\frac{1}{2}$  stivers; that 20 stivers make one florin,  $2\frac{1}{2}$  florins 1 rix dollar of Holland, that 100 rix dollars of Holland fetch 142 rix dollars of Prussia, and that 1 ducat in Berlin is worth 3 rix dollars Prussian; how many rubles will pay the debt?

$$\begin{array}{r} 1 \\ 19 \text{ --- } 95 \text{ } \mid \text{ } 2\text{---} \\ \text{--- } 2 \text{ } \mid \text{ } 1 \text{ } 00 \\ \text{--- } 2 \text{ } \mid \text{ } 5\text{---} \\ \text{--- } 1 \text{ } \mid \text{ } 100 \\ 71 \text{ --- } 142 \text{ } \mid \text{ } 3 \\ \text{--- } 1 \text{ } \mid \text{ } 1000 \end{array}$$

$$1349 \mid 3,000,000 = 2223\frac{173}{349} \text{ Ans.}$$

154. If 94 piasters at Leghorn are equal to 100 ducats at Venice, and 1 ducat is equal to 320 maravedis at Cadiz, and 272 maravedis are equal to 630 reas at Lisbon, and 400 reas are equal to 50 pence at Amsterdam, and 56 pence are equal to 3 francs at Paris, and 9 francs are equal to 94 pence at London, and 54 pence are equal to 1 dollar in the United States, how many dollars are equal to 800 piasters?

$$\begin{array}{r} \text{--- } 94 \text{ } \mid \text{ } 100\text{--- } 50 \\ \text{--- } 1 \text{ } \mid \text{ } 32 \text{ } 0 \text{ } 8\text{---} \\ 17 \text{ --- } 34 \text{ } \mid \text{ } 272 \text{ } \mid \text{ } 63 \text{ } 0 \text{ } 21\text{--- } 3\text{---} \\ \text{--- } 400 \text{ } \mid \text{ } 50\text{--- } 25 \\ \text{--- } 7 \text{ } \mid \text{ } 56 \text{ } \mid \text{ } 3\text{---} \\ \text{--- } 3 \text{ } \mid \text{ } 9 \text{ } \mid \text{ } 94\text{---} \\ 9 \text{ --- } 18 \text{ } \mid \text{ } 54 \text{ } \mid \text{ } 1 \\ \text{--- } 800\text{---} \end{array}$$

$$153 \mid 125000 = 816\frac{52}{63} \text{ Ans.}$$

155. If 140 braces at Venice be equal to 150 braces at Leghorn, and 7 braces at Leghorn be equal to 4 American yards, how many American yards are equal to  $52\frac{4}{15}$  Venetian braces?

$$\begin{array}{r} \text{---140} \bigg| \text{150---} \\ \text{---7} \bigg| \text{4} \\ \text{---15} \bigg| \text{784--- 112--- 8} \\ \hline \end{array}$$

| 32 Ans.

156. A and B barter; A has 90 pounds of tea, worth 80 cents per pound, for which B gave him wheat at 1 dollar 20 cents per bushel: how much wheat, at the above-mentioned price, will pay for A's tea?

$$\begin{array}{r} \text{---9 0 3} \\ \text{---4 ---120} \bigg| \text{80--- 2} \\ \hline \end{array}$$

| 60 Ans.

157. C has nutmegs, worth 7s 6d per pound in ready money; but in barter he will have 8s. D has tobacco, worth 9d per pound: how much must he rate it per pound, that his profit may be equal to C's?

$$\begin{array}{r} \text{9---} \\ \text{5 ---10 ---90} \bigg| \text{8--- 4} \\ \text{1} \bigg| \text{12} \\ \hline \end{array}$$

5 | 48=9 $\frac{3}{4}$  Ans.

158. G has 40 barrels of cider, worth 3 dollars per barrel, which he will barter with H for butter at 24 cents per pound: how many pounds of butter will pay for G's cider?

$$\begin{array}{r} \text{40--- 5} \\ \text{---3 ---24} \bigg| \text{---3 00} \\ \hline \end{array}$$

| 500 Ans.

159. R has 730 gallons of wine, worth 80 cents per gallon, which he will barter with S, taking beef at 3 dollars 65 cents per cwt.: how many cwt. of beef will pay for R's wine?

$$\begin{array}{r} \text{730--- 2} \\ \text{---365} \bigg| \text{60} \\ \hline \end{array}$$

| 160 Ans.

160. B has 8 tons of iron, worth 4 cents per pound, which he will barter with D for wheat at 1 dollar 12 cents per bushel ; how many bushels of D's wheat will pay for B's iron ?

$$\begin{array}{r}
 1 \mid 8 \\
 1 \mid 20 \\
 1 \mid 112 \\
 \hline
 4 \\
 \hline
 112 \mid 1 \\
 \hline
 640 \quad \text{Ans.}
 \end{array}$$

161. A has 4 tuns of wine, worth 6 shillings per gallon ; he will barter with B, taking corn at 63 cents per bushel : how many bushels of B's corn will pay for A's wine ?

$$\begin{array}{r}
 1 \mid 4 \\
 1 \mid 2 \\
 1 \mid 2 \\
 1 \mid 63 \\
 \hline
 2 \mid 8 \\
 \hline
 6 \\
 100 \\
 \hline
 63 \mid 1 \\
 \hline
 1200 \quad \text{Ans.}
 \end{array}$$

162. F has 58 cwt. of sugar, at 6 $\frac{1}{2}$  pence per pound, and will barter with B for tea, at 1 dollar 15 cents per pound : how much tea receives F for his sugar ?

$$\begin{array}{r}
 9 \mid 53 \\
 1 \mid 112 \\
 1 \mid 27 \\
 \hline
 4 \mid 1 \\
 3 \mid 12 \\
 \hline
 20 \\
 3 \\
 \hline
 23 \mid 115 \\
 \hline
 69 \mid 2968 = 43 \frac{1}{9} \quad \text{Ans.}
 \end{array}$$

The same, shorter.

$$\begin{array}{r}
 3 \text{ ---} 9 \mid 53 \\
 1 \mid 112 \text{---} 28 \\
 \text{---} 4 \mid 27 \text{---} 3 \text{---} \\
 \text{---} 9 \mid 10 \text{---} 2 \\
 \hline
 23 \text{ ---} 115 \mid 1
 \end{array}$$

$$69 \mid 2968 = 43 \frac{1}{69} \quad \text{Ans.}$$

163. A and B barter : A has cloth that cost 28 cents ; B's cost him 22 cents, and he puts it at 25 cents ; how high must A put his, to gain 10 per cent. more than B ?

$$\begin{array}{r}
 -2 \text{ ---} 22 \mid 28 \text{---} 7 \\
 -2 \text{ ---} 100 \mid 25 \text{---} 5 \\
 \hline
 \mid 35 \quad \text{Ans.}
 \end{array}$$

164. Bought wheat at 75 cents per bushel ; at what price per bushel must I sell it to gain 20 per cent. ?

$$\begin{array}{r}
 1 \mid 1 \\
 75 \text{---} 3 \\
 \hline
 -4 \text{ ---} 100 \mid 120 \text{---} 30 \\
 \hline
 \mid 90 \quad \text{Ans.}
 \end{array}$$

165. Suppose I buy coffee at 20 cents per pound ; how must I sell it per pound to gain 20 per cent. ?

$$\begin{array}{r}
 1 \mid 1 \\
 20 \text{---} \\
 \hline
 100 \text{---} \mid 120 \text{---} \\
 \hline
 \mid 24 \quad \text{Ans.}
 \end{array}$$

166. Bought wine at 90 cents per gallon ; at what rate must I sell it to gain 20 per cent. ?

$$\begin{array}{r}
 1 \mid 1 \\
 90 \text{---} \\
 \hline
 100 \text{---} \mid 120 \text{---} \\
 \hline
 \mid 108 \quad \text{Ans.}
 \end{array}$$

167. If  $\frac{1}{4}$  of  $\frac{1}{2}$  of a yard of muslin cost  $\frac{7}{10}$  of  $\frac{3}{4}$  of a £, for how many cents, New Jersey currency, must  $\frac{1}{4}$  of  $\frac{1}{2}$  of a yard be sold to gain 25 per cent. ?

—4	1
—5	4—
—4	5—
—5	8--- 2---
—5	10 7—
—7	3---
—3	8 00---
1 00—	125--- 25--- 5
	40 cts. Ans.

168. If 3 gallons of rum cost 18 shillings, how must 4 hhds. be sold, to gain 25 per cent. ?

1	4—
—3	63— 21
—2	8 18--- 9
—100	100---
	125
	\$236,25 cts. Ans.

169. A merchant in London bought 700 ells, at 5 shillings sterling per ell; the cost of transportation and duty of the whole amount was 35 per cent.; the exchange at par, or  $4\frac{1}{2}$  shillings on the dollar; for how many cents must 1 yard be sold in Philadelphia, to gain  $12\frac{1}{2}$  per cent. ?

—5	1
1	4---
—9	5---
1	2---
1 00—	1 00---
—4	100 135
—2	225--- 25—
	135 Ans.

*Note.* A merchant who is not acquainted with the rule of pure proportion, proceeds by the circumstantial calculation of the rule of three, or by practice; and, to find the answer required in this question, he is obliged to make six statements

before he is able to find the answer. As proof, we will go through the calculations of the six statements by the rule of three.

1st. How many £ sterling will 700 ells cost, at 5 shillings per ell ?

$$\begin{array}{r} 1 : 5 :: 700 \\ 700 \\ \hline 2,0)350,0 \\ \hline \\ \hline \end{array}$$

£175

2d. How much will £175 gain at 35 per cent. ?

$$\begin{array}{r} 100 : 135 :: 175 \\ 175 \\ \hline \\ 675 \\ 945 \\ 135 \\ \hline \\ 1,00)236,25 \\ \hline \\ \hline \end{array}$$

£236 $\frac{1}{2}$

3d. In £236 $\frac{1}{2}$ , how many dollars, at 4 $\frac{1}{2}$  shillings each ?

$$\begin{array}{r} 4,50 : 1 :: 23625 \\ 20 \\ \hline \\ 45,0)47250,0 \\ \hline \\ \hline \end{array}$$

\$1050

4th. How much will \$1050 amount to at 12 $\frac{1}{2}$  per cent. gain ?

$$\begin{array}{r} 100 : 112,50 :: 1050 \\ 1050 \\ \hline \\ 562500 \\ 11250 \\ \hline \\ 1,00)118125,00 \\ \hline \\ \hline \end{array}$$

\$1181,25 cts.

5th. In 700 ells, how many yards?

$$\begin{array}{r} 4 : 5 :: 700 \\ 700 \\ \hline 4)3500 \\ \hline 875 \text{ yds.} \end{array}$$

6th. If 875 yards cost \$1181.25 cts., how many cents will 1 yard cost?

$$\begin{array}{r} 875 : 1181.25 :: 1 \\ 1 \end{array}$$

$$\begin{array}{r} 875)1181.25(135 \text{ cts.} \text{ Ans.} \\ 875 \\ \hline 3062 \\ 2625 \\ \hline 4375 \\ 4375 \\ \hline \end{array}$$

170. If  $\frac{1}{6}$  of  $\frac{5}{8}$  of  $\frac{6}{7}$  of a yard of Irish linen cost  $\frac{7}{10}$  of  $\frac{3}{4}$  of  $\frac{4}{5}$  of a £, for how many cents, New Jersey currency, must  $\frac{9}{10}$  of  $\frac{5}{8}$  of  $\frac{6}{7}$  of a yard be sold to gain 30 per cent.?

$$\begin{array}{r} \begin{array}{r} \hline -12 & 9- \\ -8 & 6- \\ -6 & 5- \\ -2 & 10-3 \\ -4 & 5- \\ -5 & 8- \\ -2 & 6-7 \\ -7 & 12- \\ -5 & 10-7 \\ -7 & 3- \\ -8 & 4- \\ -9 & 8-4-2 \\ -3 & 800- \\ \hline 100- & 130-26 \end{array} \\ | 26 \text{ cts. Ans.} \end{array}$$

171. A buys 742 pounds of wool at 5 per cent., reduction for tret; pays for 1 pound neat weight 9 shillings, at 6 per cent. discount; sells this wool to B with 20 per cent. profit: how many dollars, New Jersey currency, must B pay to A?

$$\begin{array}{r|l}
 & 742\text{---}7\text{---} \\
 \hline
 -5 & 105 \\
 -15 & 100\text{---}2\text{---} \\
 1 & 9\text{---}3\text{---} \\
 -20 & 1 \\
 -3 & 8 \\
 -106 & 1\ 00\text{---} \\
 1\ 00 & 120 \\
 \hline
 & 960 \quad Ans.
 \end{array}$$

172. What is the pure proportion of a £ and \$, New Jersey currency?

$$\begin{array}{r|l}
 & 1\ 00\text{---} \\
 \hline
 1\ 0 & 9\text{---}3 \\
 4 & 1 \\
 -12 & 1 \\
 2\ 0 & 1 \\
 \hline
 & \$8=\text{£}3 \quad Ans.
 \end{array}$$

173. What is the pure proportion of a £ sterling and dollar, if  $4\frac{1}{2}$  shillings equal one dollar?

$$\begin{array}{r|l}
 & 20 \\
 \hline
 1 & 2 \\
 9 & 2 \\
 \hline
 & \text{£}9=\$40 \quad Ans.
 \end{array}$$

174. What is the pure proportion of a £ Flemish and dollar, if  $33\frac{1}{3}$  shillings Flemish are equal to one pound sterling, and  $4\frac{1}{2}$  shillings sterling equal 1 dollar?

$$\begin{array}{r|l}
 & 2\ 0\text{---} \\
 \hline
 1\ 00 & 3\text{---} \\
 & 1 \\
 & 2\ 0\text{---} \\
 3 & 2 \\
 -9 & 2 \\
 \hline
 & \text{Flem. £}3=8 \text{ dollars.} \quad Ans.
 \end{array}$$

175. What is the pure proportion of a guilder Flemish and dollar, same exchange, 6 guilders or florins being £1 Flemish?

$$\begin{array}{r} -2 -6 \\ \quad 1 \\ 1 00 - \end{array} \left| \begin{array}{r} 1 \\ 20--- \\ 3--- \\ 1 \\ 2 0--- \\ 2 \end{array} \right.$$

Guil. Flem. 9 = 4 dollars. Ans.

176. What is the pure proportion of a £ sterling and £ of Pennsylvania, exchange at  $4\frac{1}{2}$  shillings?

$$\begin{array}{r} 1 \quad 20--- \quad 5 \\ 3 -9 \quad 2--- \\ -2 -4 -8 \quad 3--- \end{array}$$

Sterling £3 = £5 Penn. Ans.

177. What is the pure proportion of a yard and English ell, if 5 quarters make 1 ell English?

$$\begin{array}{r} 1 \quad 5 \\ 4 \quad | \quad 1 \end{array}$$

Eng. ell 4 = 5 yards. Ans.

178. What is the pure proportion of a yard and ell of Hamburgh, if  $2\frac{1}{2}$  quarters of a yard make 1 ell of Hamburgh?

$$\begin{array}{r} 1 \quad 5 \\ 2 \quad | \\ 4 \quad 1 \end{array}$$

Hamburgh ell 8 = 5 yards. Ans.

179. What is the pure proportion of a £ South Carolina and a £ Pennsylvania, if  $4\frac{2}{3}$  shillings are equal to  $7\frac{1}{2}$  shills?

$$\begin{array}{r} 14 \quad 3 \\ 2 \quad | \quad 15 \end{array}$$

S. C. £28 = £45 Penn. Ans.

180. What is the pure proportion of a £ South Carolina and the dollar?

$$\begin{array}{r|rr} 1 & 14 & 7 \\ 3 & & \\ \hline -20 & 1 & \end{array}$$

\$30 = £7 S. C. Ans.

181. What is the pure proportion of a £ of New York and dollar, 8 shillings equal one dollar?

$$\begin{array}{r|rr} 1 & 20 & 5 \\ 2 & 4 & 8 \\ \hline & 1 & \end{array}$$

N. Y. £2 = \$5 Ans.

182. What is the pure proportion of a £ at New York and £ at Pennsylvania, at 8 shillings and  $7\frac{1}{2}$  shillings equalling one dollar?

$$\begin{array}{r|rr} 1 & 20 & \dots \\ 8 & 15 & \\ 2 & & \\ \hline -20 & 1 & \end{array}$$

N. Y. £16 = £15 Penn. Ans.

183. What is the pure proportion of £ Virginia and £ of Pennsylvania, at 6 shillings and  $7\frac{1}{2}$  shillings equal a dollar?

$$\begin{array}{r|rr} 2 & 15 & 5 \\ 2 & 6 & \\ \hline & & \end{array}$$

Virginia £4 = £5 Penn. Ans.

184. What is the pure proportion of a £ Virginia and dollar?

$$\begin{array}{r|rr} 1 & 20 & \dots \\ 3 & 6 & \\ \hline & 1 & \end{array}$$

Virginia £3 = \$10 Ans.

185. What is the pure proportion of a £ of Paris and dollar, if the exchange from Paris to London is 10 pence, and from London  $4\frac{1}{2}$  shillings?

$$\begin{array}{r|rr} 1 & 10 & 5 \\ 3 & 6 & 12 \\ \hline 9 & 1 & \\ & 2 & \end{array}$$

Paris £27 = \$5 Ans.

186. What is the pure proportion of an ell of Paris and Pennsylvania, if 7 ells of Paris are 12 ells Flemish, and 5 ells Flemish are 3 ells English, and 4 ells English are 4 American yards ?

$$\begin{array}{r|rr} 7 & 12 & 3 \\ -5 & 3 \\ -4 & 5 \end{array}$$

*Paris ells 7=9 yards. Ans.*

187. What sum Irish currency is worth £4326 of Paris, if the exchange between London and Paris is 36 pence per crown or £3, and Dublin 5 per cent. ?

$$\begin{array}{r|rr} -3 & 4326 & 2163 \\ -12 & 36 & 3 \\ 2 -4 -20 & 1 \\ 100 & 1 \\ & 105 & 21 \end{array}$$

$200 | 45423 = 227\frac{23}{40}$  Ans.

188. Suppose a square lot of land measures 40 rods on each side, how many acres doth it contain ?

$$\begin{array}{r|rr} -4 -160 & 40 \\ & 40 & 10 \end{array}$$

$| 10$  Ans.

189. Suppose a square lot of land measures 26 rods on each side ; how many acres doth it contain ?

$$\begin{array}{r|rr} 40 -80 -160 & 26 & 13 \\ & 26 & 13 \end{array}$$

$40 | 169 = 4\frac{9}{40}$  Ans.

*Note.* 160 rods make one acre.

190. A lot of land, in the form of a long square, is 120 rods in length and 60 rods wide ; how many acres are in it ?

$$\begin{array}{r|rr} -4 -160 & 120 & 3 \\ & 60 & 15 \end{array}$$

$| 45$  Ans.

191. If a board be 21 feet long and 18 inches broad, how many square feet are contained in it?

$$\begin{array}{r} 2 \quad 12 \quad | \quad 21 \\ \quad \quad \quad | \quad 18 \dots \quad 3 \\ \hline \end{array}$$

$$2 \mid 63 = 31 \frac{1}{2} \text{ Ans.}$$

192. If a board be 8 inches wide, how much in length will make a square foot?

$$\begin{array}{r} \dots 8 \quad | \quad 144 \dots \quad 18 \\ \hline \quad \quad \quad | \quad 18 \text{ in. Ans.} \end{array}$$

193. If a piece of land be 5 rods wide, how much in length will make an acre?

$$\begin{array}{r} \dots 5 \quad | \quad 160 \dots \quad 32 \\ \hline \quad \quad \quad | \quad 32 \text{ rods. Ans.} \end{array}$$

194. There is a triangular or three-cornered lot of land, whose base is  $51\frac{1}{2}$  rods; the perpendicular from the corner opposite the base measures 44 rods; how many acres doth it contain?

$$\begin{array}{r} \dots 2 \quad | \quad 103 \\ 160 \quad | \quad 22 \dots \quad 11 \\ \hline \end{array}$$

$$160 \mid 1133 = 7\frac{13}{160} \text{ Ans.}$$

195. What is the circumference of a wheel whose diameter is 14 feet?

$$\begin{array}{r} \dots 7 \quad | \quad 14 \dots \quad 2 \\ \quad \quad \quad | \quad 22 \\ \hline \end{array}$$

$$| \quad 44 \text{ feet. Ans.}$$

196. A square piece of timber being 18 inches broad, 8 inches thick, and 9 feet long, how many solid feet doth it contain?

$$\begin{array}{r} \dots 8 \quad -144 \quad | \quad 18 \\ \quad \quad \quad | \quad 8 \\ \quad \quad \quad | \quad 9 \\ \hline \quad \quad \quad | \quad 9 \text{ Ans.} \end{array}$$

197. If a piece of timber be 12 inches broad and 8 inches deep, how many inches in length will make a solid foot?

$$\begin{array}{r} -12 \\ -8 \\ \hline \end{array} \quad \begin{array}{r} 1728 \\ 216 \\ 18 \\ \hline \end{array}$$

| 18 Ans.

198. What is the solid content of a round stick of timber of equal bigness from end to end, whose diameter is 18 inches and length 20 feet?

$$\begin{array}{r} -2 \quad -8 \quad -144 \\ \hline \end{array} \quad \begin{array}{r} 18 \\ 18 \quad 9 \\ 7854 \\ 20 \quad 5 \\ \hline \end{array}$$

| 35,343 Ans.

199. If the diameter of a round stick of timber be 24 inches, and its length 20 feet, how many solid feet will it contain when hewn square?

$$\begin{array}{r} -12 \quad -144 \\ \hline \end{array} \quad \begin{array}{r} 12 \\ 12 \\ 2 \\ 20 \\ \hline \end{array}$$

| 40 Ans.

200. How many feet of square-edged boards,  $1\frac{1}{4}$  inches thick, including the saw calf, can be sawn from a log 20 feet long and 24 inches diameter?

$$\begin{array}{r} -12 \quad -144 \\ \hline \end{array} \quad \begin{array}{r} 12 \\ 12 \\ 2 \\ -5 \quad 20 \quad 4 \\ 4 \\ 12 \\ \hline \end{array}$$

| 384 Ans.

201. In 682 yards, how many rods or poles?

$$\begin{array}{r} -11 \\ \hline \end{array} \quad \begin{array}{r} 682 \quad 62 \\ 2 \\ \hline \end{array}$$

| 124 Ans.

202. In 4608 solid feet of wood, how many cords?

$$\begin{array}{r} \overline{-8} \\ \overline{-4} \\ \overline{-4} \\ \hline \end{array} \quad \begin{array}{r} 4608 \\ 576 \\ 144 \\ 36 \end{array}$$

| 36 Ans.

203. In a pile of wood 96 feet long, 5 feet high, and 4 feet wide, how many cords?

$$\begin{array}{r} \overline{-8} \\ \overline{-4} \\ \overline{-4} \\ \hline \end{array} \quad \begin{array}{r} 96 \\ 5 \\ 4 \end{array}$$

| 15 Ans.

204. In 10080 pints, how many tuns?

$$\begin{array}{r} \overline{-2} \\ \overline{-4} \\ \overline{-63} \\ \overline{-4} \\ \hline \end{array} \quad \begin{array}{r} 10080 \\ 160 \\ 40 \\ 10 \\ 5 \end{array}$$

| 5 Ans.

205. A man would ship 720 bushels of corn in barrels, which hold  $3\frac{1}{4}$  bushels each; how many barrels are required?

$$\begin{array}{r} \overline{-15} \\ \hline \end{array} \quad \begin{array}{r} 720 \\ 48 \\ 4 \end{array}$$

| 192 Ans.

206. If 4 yards of cloth cost 7 dollars, what cost 20 yards?

$$\begin{array}{r} \overline{-4} \\ \hline \end{array} \quad \begin{array}{r} 20 \\ 7 \end{array}$$

| 35 Ans.

207. If 28 pounds of butter cost \$5.92 cts., what cost 7 pounds?

$$\begin{array}{r} \overline{-4} \quad \overline{-28} \\ \hline \end{array} \quad \begin{array}{r} 7 \\ 592 \\ 148 \end{array}$$

| \$1.48 cts. Ans.

208. If 3 yards of cloth cost 5 dollars, what will 81 yards cost ?

$$\begin{array}{r} -3 \mid 81 \quad 27 \\ \quad \quad | 5 \\ \hline \quad \quad | 135 \text{ Ans.} \end{array}$$

209. If 5 pounds of sugar cost 9 shillings, what will 30 pounds cost ?

$$\begin{array}{r} 5 \mid 30 \\ 9 \\ \hline 20 \mid 1 \end{array}$$

$$10 \mid 27 = \text{£}2\frac{7}{10} \text{ Ans.}$$

210. If 20 yards cost \$120, how many yards may I have for 30 dollars ?

$$\begin{array}{r} -4 \mid 120 \quad 30 \\ \quad \quad | 20 \quad 5 \\ \hline \quad \quad | 5 \text{ Ans.} \end{array}$$

211. If 12 yards of cloth cost  $9\frac{3}{4}$  dollars, what cost 192 yards ?

$$\begin{array}{r} -12 \mid 192 \quad 16 \quad 4 \\ \quad \quad | 39 \\ \hline \quad \quad | 156 \text{ Ans.} \end{array}$$

212. What will 9 yards of cambric cost, at the rate of \$40.96 cts. for 72 yards ?

$$\begin{array}{r} -8 \mid 72 \quad 9 \\ \quad \quad | 4096 \quad 512 \\ \hline \quad \quad | 512 \text{ Ans.} \end{array}$$

213. If  $4\frac{1}{2}$  tons of hay will keep 3 cattle over the winter, how many tons will keep 25 cattle the same time ?

$$\begin{array}{r} -3 \mid 25 \\ 2 \mid 9 \quad 3 \\ \hline 2 \mid 75 = 37\frac{1}{2} \text{ Ans.} \end{array}$$

214. A draper bought 8 packages of cloth, each containing 4 parcels, each parcel 10 pieces, and each piece 26 yards,

and gave after the rate of £4 $\frac{1}{2}$  for 6 yards : I would know what the 8 packages stood him in ?

$$\begin{array}{r}
 8 \\
 4 \\
 10 \quad 2 \\
 -6 \quad 26 \\
 -5 \quad 24 \quad 4 \\
 \hline
 \end{array}$$

| £6656 Ans.

215. If 48 men can build a wall in 24 days, how many men can do the same in 192 days ?

$$\begin{array}{r}
 48 \\
 -4 \quad -192 \quad 24 \quad 6 \\
 \hline
 \end{array}$$

| 6 Ans.

216. If 160 rods long and 1 rod wide make an acre, how much in length, that is 8 rods wide, must be taken to contain an acre ?

$$\begin{array}{r}
 160 \quad 20 \\
 ---8 \quad 1 \\
 \hline
 \end{array}$$

| 20 rods. Ans.

217. How many labourers must be employed to finish a piece of work in 15 days, which 5 men can do in 24 days ?

$$\begin{array}{r}
 24 \quad 8 \\
 ---3 \quad -15 \quad 5 \\
 \hline
 \end{array}$$

| 8 Ans.

218. If a man performs a journey in 6 days when the day is 8 hours long, in what time will he do it when the day is 12 hours long ?

$$\begin{array}{r}
 8 \quad 4 \\
 ---2 \quad -12 \quad 6 \\
 \hline
 \end{array}$$

| 4 Ans.

219. If I lend my friend \$100 for 180 days, how long ought he to lend me \$450, to return my kindness to him ?

$$\begin{array}{r}
 100 \quad 20 \\
 ---5 \quad -450 \quad 180 \quad 2 \\
 \hline
 \end{array}$$

| 40 days. Ans.  
M

220. How many yards of matting,  $2\frac{1}{2}$  feet broad, will cover a floor that is 27 feet long and 20 feet broad?

$$\begin{array}{r}
 & \left| \begin{array}{r} -27 & 9 \\ -20 & 4 \\ \hline -5 & 2 \\ \hline -3 & 1 \end{array} \right. \\
 \hline
 & | 72 \text{ Ans.}
 \end{array}$$

221. What quantity of shalloon that is  $\frac{2}{3}$  of a yard wide, will line  $7\frac{1}{2}$  yards of cloth that is  $1\frac{1}{4}$  yards wide?

$$\begin{array}{r}
 & \left| \begin{array}{r} 2 \\ 3 \\ \hline -2 & 15 \end{array} \right. \\
 \hline
 & | 15 \text{ Ans.}
 \end{array}$$

222. There is a cistern having a pipe which will empty it in 15 hours; how many pipes of the same capacity will empty it in 3 quarters of an hour?

$$\begin{array}{r}
 & \left| \begin{array}{r} 15 & 5 \\ 4 \\ \hline \end{array} \right. \\
 \hline
 & | 20 \text{ Ans.}
 \end{array}$$

223. If  $\frac{4}{5}$  of a yard of cloth cost 7 dollars, what is the cost of  $1\frac{3}{5}$  of a yard?

$$\begin{array}{r}
 & \left| \begin{array}{r} 15 & 6 & 2 \\ 4 & 5 \\ \hline 7 \\ \hline \end{array} \right. \\
 \hline
 & | 2 | 7 = 3\frac{1}{2} \text{ Ans.}
 \end{array}$$

224. Suppose  $\frac{3}{4}$  of an acre of land to be worth 54 dollars; what is  $\frac{1}{2}$  of an acre worth?

$$\begin{array}{r}
 & \left| \begin{array}{r} 1 \\ 4 \\ \hline 54 & 6 & 2 \\ \hline \end{array} \right. \\
 \hline
 & | \$8 \text{ Ans.}
 \end{array}$$

225. If the wages of 6 men for 14 days be 84 dollars, what will be the wages of 9 men for 11 days?

$$\begin{array}{r|l} -6 & 9 \\ -14 & 11 \\ \hline & 84 \quad 6 \\ \hline & \end{array}$$

| \$99 Ans.

226. If 3 lbs. of yarn make 9 yards of cloth, 5 quarters wide, how many lbs. will be required to make a piece of cloth 45 yds. long, and 4 quarters wide?

$$\begin{array}{r|l} -9 & 45 \quad 5 \\ -5 & 4 \\ \hline & 3 \\ \hline & \end{array}$$

| 12 lbs. Ans.

227. If a class of 25 boys perform 1750 examples in arithmetic in 15 hours, how many examples of equal length may a class of 30 boys perform in 18 hours?

$$\begin{array}{r|l} -25 & 30 \quad 2 \\ -15 & 18 \\ \hline & 1750 \quad 70 \\ \hline & \end{array}$$

| 2520 Ans.

228. If the use of 100 dollars for 90 days be worth 1 dollar 50 cents, what is the use of 78 dollars worth for 85 days?

$$\begin{array}{r|l} -2 \quad -100 & 78 \quad 39 \quad 13 \\ 2 \quad -30 \quad -90 & 85 \quad 17 \\ \hline & 150 \\ \hline & \end{array}$$

2 | 221 = 110½ Ans.

229. If a man travels 217 miles in 7 days, travelling 6 hours a day, how many miles will he travel in 9 days, if he travels 11 hours a day?

$$\begin{array}{r|l} -7 & 9 \quad 3 \quad 1\frac{1}{2} \\ ---2 \quad ---6 & 11 \\ \hline & 217 \quad 31 \\ \hline & \end{array}$$

| 511½ Ans.

230. If a man performs a journey of 1250 miles in 15 days

by travelling 14 hours a day, how many days will it take him to perform a journey of 1000 miles by travelling 13 hours a day?

$$\begin{array}{r} \text{---5 ---1250} \\ \text{13} \end{array} \left| \begin{array}{r} 1000 \\ 14 \\ \hline 15 \end{array} \right. \begin{array}{l} 4 \\ \\ 3 \end{array}$$

$$13 \mid 168 = 12 \frac{2}{3} \text{ Ans.}$$

231. If 10 cows eat  $7\frac{1}{2}$  tons of hay in 14 weeks, how many cows will eat  $22\frac{1}{2}$  tons in 28 weeks?

$$\begin{array}{r} \text{---2} \\ \text{---15} \\ \text{---2} \end{array} \left| \begin{array}{r} 45 \\ 2 \\ \hline 14 \\ 10 \end{array} \right. \begin{array}{l} 3 \\ \\ \\ 5 \end{array}$$

$$15 \text{ Ans.}$$

232. Three partners, A, B, and C, shipped 108 mules for the West Indies; of which A owned 48, B owned 36, and C owned 24; but, in stress of weather, the mariners were obliged to throw 45 of them overboard: I demand how much of the loss each owner sustained?

*Stocks.*

$$\begin{array}{r} 48 \\ 36 \\ 24 \\ \hline 108 \end{array} \quad \begin{array}{r} \text{---12 ---108} \\ \text{---12} \end{array} \left| \begin{array}{r} 48 \\ 45 \\ \hline 20 \end{array} \right. \begin{array}{l} 4 \\ 5 \\ \hline 20 \end{array} \text{ A's loss.}$$

$$\begin{array}{r} \text{---12 ---108} \\ \text{---12} \end{array} \left| \begin{array}{r} 36 \\ 45 \\ \hline 15 \end{array} \right. \begin{array}{l} 3 \\ 5 \\ \hline 15 \end{array} \text{ B's loss.} \quad \begin{array}{r} \text{---12 ---108} \\ \text{---12} \end{array} \left| \begin{array}{r} 24 \\ 45 \\ \hline 10 \end{array} \right. \begin{array}{l} 2 \\ 5 \\ \hline 10 \end{array} \text{ C's loss.}$$

233. Three merchants make a joint stock of £1200; of which A put in £240, B £360, and C £600; and, by trading, they gained £325: what is each one's part of the gain?

*Stocks.*

$$\begin{array}{r} 240 \\ 360 \\ 600 \\ \hline 1200 \end{array} \quad \begin{array}{r} \text{---5 ---1200} \\ \text{---5} \end{array} \left| \begin{array}{r} 240 \\ 325 \\ \hline 65 \end{array} \right. \begin{array}{l} \\ \\ \hline \end{array} \text{ £65 A's gain.}$$

2 -- 10 -- 1200	360 -- 3 --	2 -- 1200	600 --
	325 -- 65		325
2   £195 = 97, <i>B's.</i>		2   £325 = 162 <i>1/2 C's</i>	

234. Three merchants entered into partnership for one year. A's stock was \$180, B's \$60, and C's \$40; and they gained \$560: what part of the gain had each?

*Stocks.*

180	—280	180
60		560 — 2
40		
—		
280		\$360 <i>A's gain.</i>

—280	60	—280	40
	560 — 2		560 — 2
	\$120 <i>B's gain.</i>		\$80 <i>C's gain.</i>

235. G and U trade in company; G but in \$200 for 6 months; U put in \$300 for 12 months; and, by trading, they gained \$960: what is the gain of each?

*Stocks.*

200 × 6 = 1200	—4800	120 0 --
300 × 12 = 3600		960 -- 2
—		
\$4800		\$240 <i>G's gain.</i>
—4800	360 0 --	
	960 -- 2	
	\$720 <i>U's gain.</i>	

236. A, B, and C trade in company; A put in \$600 for 4 months; B put in \$800 for 6 months; C put in \$100 for 12 months, and they gained \$2100: what is the gain of each?

600 × 4 = 2400	—4	—8400	2400 — 600
800 × 6 = 4800			2100 —
100 × 12 = 1200			
—			
8400			\$600 <i>A's gain.</i>
—4 —8400	4800 — 1200	—4 —8400	1200 — 300
	2100 —		2100 —
	\$1200 <i>B's gain.</i>		\$300 <i>C's gain.</i>
	M 2		

237. If 6 men will mow 35 acres of grass in 7 days, by working 10 hours a day, how many men will be required to mow 48 acres in 5 days, when they work 12 hours a day?

$$\begin{array}{r}
 5 \text{ --- } 35 \quad 48 \text{ --- } 4 \\
 \text{---} \quad \text{---} \quad \text{---} \quad \text{---} \\
 \text{---} \quad 5 \quad 7 \text{ --- } \\
 \text{---} \quad \text{---} \quad 10 \text{ --- } 2 \\
 \text{---} \quad \text{---} \quad \text{---} \quad 6 \\
 \hline
 5 \mid 48 = 9 \frac{3}{5} \quad \text{Ans.}
 \end{array}$$

238. If 16 men can build 18 rods of wall in 12 days, how many men must be employed to build 72 rods of the same kind of wall in 8 days?

$$\begin{array}{r}
 18 \text{ --- } 72 \text{ --- } 4 \\
 \text{---} \quad \text{---} \quad \text{---} \\
 \text{---} \quad 8 \quad 12 \\
 \text{---} \quad \text{---} \quad 16 \text{ --- } 2 \\
 \hline
 18 \mid 96 \quad \text{Ans.}
 \end{array}$$

239. If 154 bushels of oats will serve 14 horses for 14 days, how long will 406 bushels serve 7 horses?

$$\begin{array}{r}
 11 \text{ --- } 154 \text{ --- } 406 \\
 \text{---} \quad \text{---} \quad \text{---} \\
 \text{---} \quad 7 \quad 14 \text{ --- } \\
 \text{---} \quad \text{---} \quad 14 \text{ --- } 2 \\
 \hline
 11 \mid 812 = 73 \frac{9}{11} \quad \text{Ans.}
 \end{array}$$

240. If 25 men can earn 6250 dollars in 2 years, how long will it take 5 men to earn \$11250?

$$\begin{array}{r}
 \text{---} \quad 5 \quad 25 \text{ --- } \\
 \text{---} \quad 25 \quad 6250 \quad 11250 \text{ --- } 225 \text{ --- } 9 \\
 \text{---} \quad \text{---} \quad \text{---} \quad \text{---} \\
 \text{---} \quad \text{---} \quad \text{---} \quad 2 \\
 \hline
 \text{---} \mid 18 \text{ yrs.} \quad \text{Ans.}
 \end{array}$$

241. If 9 men can now 36 acres of grass in 4 days, how many acres will 19 men mow in 11 days?

$$\begin{array}{r}
 \text{---} \quad 9 \quad 19 \\
 \text{---} \quad 4 \quad 11 \\
 \text{---} \quad \text{---} \quad 36 \text{ --- } 9 \text{ --- } \\
 \hline
 \text{---} \mid 209 \quad \text{Ans.}
 \end{array}$$

242. If a family of 9 persons spend 450 dollars in 5 months, how much would be sufficient to maintain the family 8 months, if 5 more persons were added?

$$\begin{array}{r}
 \begin{array}{c|c}
 -9 & 14 \\
 -5 & 8 \\
 \hline
 & -45 \ 0 \ 5 \\
 \hline
 & \$1120 \quad Ans.
 \end{array}
 \end{array}$$

243. If a stream of water, running into a pond of 190 acres, will raise the pond 10 inches in 12 hours, how much would a pond of 50 acres be raised by the same stream in 10 hours?

$$\begin{array}{r}
 \begin{array}{c|c}
 -50 & 190--- 95 \\
 3 -6 -12 & 1 0--- \\
 \hline
 & 10--- 2---
 \end{array}
 \end{array}$$

3 | 95 = 31 $\frac{1}{3}$  Ans.

244. If 725 bottles hold 4 barrels of wine, how many bottles are required to hold 3 tierces of wine?

$$\begin{array}{r}
 \begin{array}{c|c}
 1 & 3--- \\
 -21 -63 & 42--- 2--- \\
 \hline
 & 2--- \\
 & 725
 \end{array}
 \end{array}$$

| 725 Ans.

245. If 12 men can build a brick wall 25 feet long, 7 feet high, and 4 feet thick in 18 days, in how many days will 20 men build a brick wall 150 feet long, 8 feet high, and 5 feet thick?

$$\begin{array}{r}
 \begin{array}{c|c}
 -4 -20 & 12--- 3 \\
 -25 & 150--- 6 \\
 7 & 8--- 2 \\
 -4 & 5--- \\
 \hline
 & 18
 \end{array}
 \end{array}$$

7 | 648 = 92 $\frac{1}{3}$  Ans.

246. If 15 men can dig a trench 75 feet long, 8 feet wide, and 6 feet deep in 12 days, how many men must be employed to dig a trench 300 feet long, 12 feet wide, and 9 feet deep in 10 days ?

$$\begin{array}{r|rr}
 -75 & 300 & 4 \\
 -8 & 12 & 2 \\
 -6 & 9 \\
 -10 & 12 & 6 \\
 \hline
 & 15 & 3
 \end{array}$$

| 162. *Ans.*

247. If 175 bushels of corn, when corn is worth 60 cts. per bushel, be given for the carriage of 100 barrels of flour 58 miles, how many bushels of corn, when corn is worth 75 cents per bushel, must be given for the carriage of 90 barrels of flour 200 miles ?

$$\begin{array}{r|rr}
 -3 -75 & 60 & 20 & 10 \\
 100 & 90 \\
 29 -58 & 200 \\
 \hline
 & 175 & 7
 \end{array}$$

29 | 12600 = 434  $\frac{1}{2}$  *Ans.*

248. Reduce  $\frac{1}{240}$  of a pound to the fraction of a shilling.

$$\begin{array}{r|rr}
 12 -240 & 1 \\
 & 20 \\
 \hline
 12 & 1 = \frac{1}{2}
 \end{array}$$

*Ans.*

249. Reduce  $\frac{1}{1920}$  of a pound to the fraction of a farthing.

$$\begin{array}{r|rr}
 2 -4 -16 -1920 & 1 \\
 & 20 \\
 & 12 \\
 & 4 \\
 \hline
 2 & 1 = \frac{1}{2}
 \end{array}$$

*Ans.*

250. Reduce  $\frac{1}{1008}$  of a hhd. to the fraction of a gallon.

$$\begin{array}{r|rr}
 16 -1008 & 1 \\
 & 63 \\
 \hline
 16 & 1 = \frac{1}{16}
 \end{array}$$

*Ans.*

251. Reduce  $\frac{5}{1008}$  of a cwt. to the fraction of a pound.

$$\begin{array}{r} 9 \text{ ---} 252 \text{ ---} 1008 \\ \hline 5 \\ | \\ 4 \\ | \\ 28 \end{array}$$

$$9 \mid 5 = \frac{5}{9} \text{ Ans.}$$

252. Reduce  $\frac{4}{2520}$  of a hhd. to the fraction of a pint.

$$\begin{array}{r} 5 \text{ ---} 10 \text{ ---} 630 \text{ ---} 2520 \\ \hline 4 \\ | \\ 63 \\ | \\ 4 \\ | \\ 2 \end{array}$$

$$5 \mid 4 = \frac{4}{5} \text{ Ans.}$$

253. Reduce  $\frac{3}{180}$  of a pound to the fraction of a shilling.

$$\begin{array}{r} 3 \text{ ---} 6 \text{ ---} 180 \\ \hline 3 \\ | \\ 20 \end{array}$$

$$3 \mid 1 = \frac{1}{3} \text{ Ans.}$$

254. Reduce  $\frac{1}{2}$  of a shilling to the fraction of a pound.

$$\begin{array}{r} 12 \mid 1 \\ 20 \mid 1 \end{array}$$

$$240 \mid 1 = \frac{1}{240} \text{ Ans.}$$

255. Reduce  $\frac{1}{2}$  of a farthing to the fraction of a pound.

$$\begin{array}{r} 2 \mid 1 \\ 4 \mid 1 \\ 12 \mid 1 \\ 20 \mid 1 \end{array}$$

$$1920 \mid 1 = \frac{1}{1920} \text{ Ans.}$$

256. How many acres in a piece of land 560 rods long and 32 rods wide?

$$\begin{array}{r} -160 \mid 560 \\ | \\ 32 \mid 2 \\ \hline 112 \text{ Ans} \end{array}$$

257. How many acres are contained in the road from Boston to Providence, allowing the distance to be 40 miles, and the average width of the road 4 rods?

$$\begin{array}{r}
 & 40 \\
 1 & 8 \\
 1 & 40 \\
 \hline
 -4 & 160 \quad 4
 \end{array}$$

| 320 Ans.

258. How many yards of carpeting that is  $\frac{3}{4}$  of a yard wide, are sufficient to cover a floor that is 18 feet wide and 60 feet long?

$$\begin{array}{r}
 -3 \quad 4 \\
 & 18 \quad 2 \\
 -9 \quad -6 \quad 0 \quad 2 \\
 & & 1
 \end{array}$$

| 160 yds. Ans.

259. What is the weight of a pea to a steelyard, which, being suspended 39 inches from the centre of motion, will equipoise 208 lbs. suspended at the draught end  $\frac{3}{4}$  of an inch?

$$\begin{array}{r}
 -13 \quad -39 \quad 208 \quad 52 \quad 4 \\
 & -4 \quad 3
 \end{array}$$

| 4 lbs. Ans.

260. If 17 tons 12 cwt. of iron cost \$880, what cost 2 cwt.?

$$\begin{array}{r}
 -20 \quad 2 \\
 & 1 \\
 -88 \quad 5 \\
 & 880
 \end{array}$$

| \$5 Ans.

261. A borrowed of B \$250 for 7 months; and, in return, lent him \$300: how long ought he to keep it, that the interest of it may be equal to that of the first sum?

$$\begin{array}{r}
 6 \quad -300 \quad 250 \quad 5 \\
 & & 7
 \end{array}$$

6 | 35 =  $5\frac{5}{6}$  mo. Ans.

262. How much in length, that is  $4\frac{1}{2}$  inches broad, will make a foot square?

$$\begin{array}{r} 12\cdots 4 \\ -3 \quad -9 \quad | \quad 12\cdots 4 \\ \hline 2 \end{array}$$

| 32 inches. Ans.

263. If 12 pears are worth 21 apples, and 3 apples cost 1 cent, what will be the price of fourscore and four pears?

$$\begin{array}{r} 21\cdots 7 \\ -3 \quad | \quad 1 \\ \hline 84\cdots 7 \end{array}$$

| 49 cts. Ans.

264. If 40 rods in length and 4 in breadth make an acre, what must be the length to make an acre when the breadth is 15 rods?

$$\begin{array}{r} 4 \\ 3 \quad -15 \quad | \\ \hline 40\cdots 8 \end{array}$$

3 | 32 =  $10\frac{2}{3}$  Ans.

265. What is the interest of \$750 for 3 years, at 6 per cent. per annum?

$$\begin{array}{r} 750\cdots 30\cdots 15 \\ -12 \quad | \quad 36\cdots 3 \\ \hline 6\cdots 3 \end{array}$$

| \$135 Ans.

266. What is the interest of \$7500 for 4 months, at 7 per cent.?

$$\begin{array}{r} 75\ 00\cdots 25 \\ -3 \quad -12 \quad | \quad 4\cdots \\ \hline 7 \end{array}$$

| \$175 Ans.

267. What is the interest of \$575 for 73 days, at 7 per cent.?

$$\begin{array}{r} 575\cdots 115 \\ -5 \quad -365 \quad | \quad 73\cdots \\ \hline 7 \end{array}$$

| \$8,05 cts. Ans.

268. How much wheat, at \$1.25 cts. per bushel, must be given in barter for 50 bushels of rye, at 70 cents per bushel?

$$\begin{array}{r} 50 \text{---} 2 \\ \hline 5 \text{---} 125 \mid 70 \text{---} 14 \\ \hline \end{array}$$

| 28 Ans.

269. If 14 horses eat 56 bushels of oats in 16 days, how many bushels will be sufficient for 20 horses 24 days?

$$\begin{array}{r} 20 \\ \hline 4 \text{---} 16 \mid 24 \text{---} 6 \\ \hline 56 \text{---} 4 \text{---} \\ \hline \end{array}$$

| 120 Ans.

270. If a field will feed 6 cows 91 days, how long will it feed 21 cows?

$$\begin{array}{r} 6 \text{---} 2 \\ \hline 7 \text{---} 21 \mid 91 \text{---} 13 \\ \hline \end{array}$$

| 26 days. Ans.

271. Andrew had fine peaches, 9 of which were worth 6 cents; William had apples, 8 of which were worth 2 cents: I require the number of apples that William must give Andrew for 15 of his peaches?

$$\begin{array}{r} 6 \text{---} 3 \text{---} \\ \hline 2 \text{---} 8 \\ \hline 15 \text{---} 5 \\ \hline \end{array}$$

| 40 Ans.

272. If  $\frac{1}{4}$  of a yard cost  $\frac{2}{3}$  of a shilling, what will  $\frac{7}{8}$  of a yard cost?

$$\begin{array}{r} 7 \\ 4 \\ 2 \\ \hline \end{array}$$

3 | 7 =  $2\frac{1}{3}$ s. Ans.

273. If  $\frac{2}{5}$  of a yard cost  $\frac{7}{3}$  of a £, what will  $\frac{3}{4}$  of a yard come to?

$$\begin{array}{r} 3 \\ 5 \\ 7 \\ \hline \end{array}$$

6 | 1 =  $\frac{1}{6}$  of a £. Ans.

274. If  $3\frac{1}{2}$  times  $3\frac{1}{2}$  lbs. cost  $1\frac{1}{2}$  times £1 $\frac{1}{2}$ , what is the value of  $\frac{1}{2}$  of  $\frac{1}{3}$  of  $12\frac{1}{2}$  lbs.?

2	1
—3	1
—4	49— 7—
—7	2—
—7	2—
—2	3—
—2	3
1	20— 5

$$2 \mid 15 = 7\frac{1}{2} \text{ shillings. Ans.}$$

275. How much shalloon,  $\frac{3}{4}$  of a yard wide, will line  $4\frac{1}{2}$  yards of cloth,  $1\frac{1}{2}$  yards wide?

—3	4— 2—
—2	9
—2	3—

$$| 9 \text{ yds. Ans.}$$

276. What quantity of shalloon,  $\frac{3}{4}$  of a yard wide, will line  $7\frac{1}{2}$  yards of cloth,  $1\frac{1}{2}$  yards wide?

—3	4— 2—
—2	15
—2	3—

$$| 15 \text{ yds. Ans.}$$

277. If 16 men finish a piece of work in  $28\frac{1}{3}$  days, how long will 12 men require to do the same work?

3	—12	16— 4
3	85	

$$9 \mid 340 = 37\frac{7}{9} \text{ days. Ans.}$$

278. If  $\frac{1}{2}$  of a yard of cloth,  $\frac{7}{8}$  yard wide, cost £ $\frac{2}{5}$ , what is the value of  $\frac{5}{8}$  of a yard,  $1\frac{1}{4}$  yards wide, of the same quality?

—8	5—
—4	7—
3	4—
—7	8—
—5	2
1	20

$$3 \mid 40 = 13\frac{1}{3} \text{ shillings. Ans.}$$

N

279. If £600 principal gain £33 $\frac{1}{3}$  interest in  $10\frac{2}{3}$  months, in what time will £100 gain £6 $\frac{1}{4}$ ?

$$\begin{array}{r}
 \begin{array}{c}
 \overline{-4} \quad \overline{-100} \quad | \quad 6 \ 00 \\
 \overline{-4} \quad \overline{25} \\
 \overline{1 \ 00} \quad | \quad 3 \\
 \overline{-3} \quad \overline{32 \ 8} \quad | \quad 2
 \end{array} \\
 \hline
 | \quad 12 \text{ mo. Ans.}
 \end{array}$$

280. If 2 men in  $\frac{3}{4}$  of a year expend \$56 $\frac{1}{4}$ , how much will defray the expenses of 3 persons for  $5\frac{1}{3}$  years at the same rate?

$$\begin{array}{r}
 \begin{array}{c}
 \overline{-2} \quad | \quad 3 \\
 \overline{-3} \quad | \quad 16 \quad 8 \\
 \overline{-3} \quad | \quad 4 \\
 \overline{-4} \quad | \quad 225 \quad 75
 \end{array} \\
 \hline
 | \quad \$600 \quad \text{Ans.}
 \end{array}$$

281. How many men can do as much work in  $\frac{4}{10}$  of a month as 16 men can do in  $1\frac{1}{2}$  months?

$$\begin{array}{r}
 \begin{array}{c}
 \overline{-4} \quad | \quad 10 \\
 \overline{-2} \quad | \quad 3 \\
 \overline{16} \quad | \quad 4 \quad 2
 \end{array} \\
 \hline
 | \quad 60 \quad \text{Ans.}
 \end{array}$$

282. What sum has A at interest, when it yields as much in  $7\frac{1}{2}$  months as B's \$450 does in 15 months?

$$\begin{array}{r}
 \begin{array}{c}
 \overline{-15} \quad | \quad 2 \\
 \overline{15} \quad | \quad 450
 \end{array} \\
 \hline
 | \quad \$900 \quad \text{Ans.}
 \end{array}$$

283. When 12 oxen graze  $16\frac{1}{4}$  acres of grass in 20 days, how much will suffice 24 oxen 100 days?

$$\begin{array}{r}
 \begin{array}{c}
 \overline{-12} \quad | \quad 24 \quad 2 \\
 \overline{-20} \quad | \quad 100 \quad 5 \\
 \overline{2 \quad -4} \quad | \quad 65
 \end{array} \\
 \hline
 2 \quad | \quad 325 = 162\frac{1}{4} \quad \text{Ans.}
 \end{array}$$

284. If a cellar  $22\frac{1}{2}$  feet long,  $17\frac{1}{5}$  feet wide, and  $10\frac{1}{4}$  feet deep, be dug in  $2\frac{1}{2}$  days by 6 men, working  $12\frac{3}{10}$  hours a day, how many days, of  $8\frac{1}{2}$  hours, should 9 men take to dig another, measuring 45 feet long,  $34\frac{3}{8}$  wide, and  $12\frac{3}{10}$  deep?

$$\begin{array}{r|rr}
 -5 & 41 \\
 -123 & 10 & 2 \\
 -3 & 6 & 9 & 3 \\
 -45 & 45 \\
 & 2 \\
 -5 & 173 \\
 -173 & 1 & 0 \\
 1 & 0 & 123 \\
 -41 & 4 \\
 -2 & 5 \\
 \hline
 \end{array}$$

| 12 days. Ans.

285. What is the freight of 10,000 bricks from Waldoboro' to Boston, at \$1.25 cts. per 2000 lbs., allewing 6 bricks to weigh  $26\frac{1}{2}$  lbs.?

$$\begin{array}{r|rr}
 6 & -10 & 000 & 5 \\
 -2 & 53 \\
 \hline
 2 & 000 & 125 \\
 \hline
 \end{array}$$

| 12 |  $33125 = \$27,60$  cts. Ans.

286. If a man receives \$15 for 1 year's interest of money lent, at 6 per cent. per annum, how much was the sum lent?

$$\begin{array}{r|rr}
 -2 & -6 & 15 & 5 \\
 \hline
 & 100 & 50 \\
 \hline
 \end{array}$$

| \$250 Ans.

287. If 8 boarders drink a barrel of cider in 12 days, how long would it last, if 4 more came among them?

$$\begin{array}{r|rr}
 -12 & 8 \\
 & 12 \\
 \hline
 \end{array}$$

| 8 days. Ans.

288. When wheat is sold at 93 cents per bushel, the penny loaf weighs 12 ounces; what must it weigh when the wheat is \$1.24 cts. per bushel?

$$\begin{array}{r|rr}
 -31 & -124 & 93 & 3 \\
 & 12 & 3 \\
 \hline
 & 9 & ounces. Ans
 \end{array}$$

289. How many yards of baize,  $\frac{3}{4}$  wide, will line a cloak which has in it 12 yards of camlet,  $\frac{1}{2}$  a yard wide?

$$\begin{array}{r} -3 \mid 4 \\ -4 \mid 2 \\ \hline 12 \mid 4 \end{array}$$

18 yds. Ans.

290. Suppose 400 men in a garrison are provided with provisions for 30 days; how many men must be sent out, if they would have the provisions last 50 days?

$$\begin{array}{r} 400 \quad \quad \quad -50 \mid 30 \\ 240 \quad \quad \quad \quad \quad \mid 400 \quad 80 \\ \hline 160 \quad \quad \quad \quad \quad \mid 240 \end{array}$$

291. If a head of 7 feet of water with 30 mill powers will reduce a pond of 200 acres 8 inches in a day, how much will a head of 6 feet reduce it in the same time?

$$\begin{array}{r} 3 \mid 6 \mid 7 \\ \quad \quad \quad \quad \quad \mid 8 \quad 4 \\ \hline 3 \mid 28 = 9 \frac{1}{3} \quad \text{Ans.} \end{array}$$

292. If 30 mill powers would reduce a pond of 7 feet head  $7\frac{1}{4}$  inches in a day, how much would they reduce a pond of 6 feet  $6\frac{1}{4}$  inches head in the same time?

$$\begin{array}{r} -21 \mid -315 \mid 4 \\ \quad \quad \quad \quad \quad \mid 84 \quad 4 \quad 2 \\ \quad \quad \quad \quad \quad \mid -2 \quad 15 \\ \hline \quad \quad \quad \quad \quad \mid 8 \text{ inches. Ans.} \end{array}$$

293. A ship's company, of 15 persons, is supposed to have bread to last their voyage, allowing each 8 ounces per day: when they picked up a crew of 5 persons in distress, to whom they are willing to communicate, what will the daily allowance of each person then be?

$$\begin{array}{r} -4 \mid -20 \mid 15 \mid 3 \\ \quad \quad \quad \quad \quad \mid 8 \quad 2 \\ \hline \quad \quad \quad \quad \quad \mid 6 \text{ ounces. Ans.} \end{array}$$

294. A person engaged to remove 800 tons of timber from Exeter to the navy-yard, in Portsmouth. If in 6 days he has

removed 450 tons with 36 oxen, how many oxen would be wanted to remove the remainder in 3 days?

$$\begin{array}{r} \overline{-9} \quad \overline{450} \\ \overline{-3} \quad \overline{350} \quad 7 \\ \overline{3} \quad \overline{6} \quad 2 \\ \overline{36} \quad \overline{4} \\ \hline \end{array}$$

| 56 oxen. *Ans.*

295. If 10 acres would feed 15 oxen, how many will 24 acres feed?

$$\begin{array}{r} \overline{-2} \quad \overline{10} \\ \overline{-15} \quad \overline{24} \quad 12 \\ \overline{15} \quad \overline{3} \\ \hline \end{array}$$

| 36 oxen. *Ans.*

296. In a board or plank 16 feet long and 3 inches wide, how many feet?

$$\begin{array}{r} \overline{-4} \quad \overline{12} \\ \overline{-3} \quad \overline{16} \quad 4 \\ \overline{3} \\ \hline \end{array}$$

| 4 feet. *Ans.*

297. In a board or plank 24 feet long and 9 inches wide, how many feet?

$$\begin{array}{r} \overline{-12} \quad \overline{24} \quad 2 \\ \overline{9} \\ \hline \end{array}$$

| 18 feet. *Ans.*

298. In a board or plank 60 feet long and 18 inches wide, how many feet?

$$\begin{array}{r} \overline{-12} \quad \overline{60} \quad 5 \\ \overline{18} \\ \hline \end{array}$$

| 90 feet. *Ans.*

299. In a board or plank  $8\frac{1}{2}$  feet long and 14 inches wide, how many feet?

$$\begin{array}{r} \overline{-7} \quad \overline{60} \quad 5 \\ \overline{-12} \quad \overline{14} \quad 2 \\ \hline \end{array}$$

| 10 feet. *Ans.*

300. In a board or plank  $6\frac{9}{11}$  feet long and 22 inches wide, how many feet?

$$\begin{array}{r} -11 \\ -12 \end{array} \left| \begin{array}{r} 72 \\ 22 \end{array} \right. \begin{array}{r} 6 \\ 2 \end{array}$$

| 12 feet. Ans.

301. In a board or plank 30 feet long and 18 inches wide, how many feet?

$$\begin{array}{r} -2 \\ -2 \end{array} \left| \begin{array}{r} 30 \\ 18 \end{array} \right. \begin{array}{r} 15 \\ 3 \end{array}$$

| 45 feet. Ans.

302. In a board or plank 48 feet long and 7 inches wide, how many feet?

$$\begin{array}{r} -12 \\ -12 \end{array} \left| \begin{array}{r} 48 \\ 7 \end{array} \right. \begin{array}{r} 4 \\ \end{array}$$

| 28 feet. Ans.

303. What is the content of a piece of timber 40 feet long, and the sides 18 by 21 inches?

$$\begin{array}{r} -8 \\ -8 \end{array} \left| \begin{array}{r} 40 \\ 18 \\ 21 \end{array} \right. \begin{array}{r} 5 \\ \end{array}$$

| 105 feet. Ans.

304. What is the content of a piece of timber 48 feet long, and the sides 14 by 9 inches?

$$\begin{array}{r} -3 \\ -3 \end{array} \left| \begin{array}{r} 48 \\ 14 \\ 9 \end{array} \right. \begin{array}{r} \end{array}$$

| 42 feet. Ans.

305. What is the content of a piece of timber 96 feet long, and the sides 6 by 18 inches?

$$\begin{array}{r} -8 \\ -8 \end{array} \left| \begin{array}{r} 96 \\ 6 \\ 18 \end{array} \right. \begin{array}{r} 12 \\ \end{array}$$

| 72 feet. Ans.

306. What is the content of a piece of timber 9 feet long, and the sides 32 by 7 inches?

$$\begin{array}{r} -16 \\ -16 \end{array} \left| \begin{array}{r} 9 \\ 32 \\ 7 \end{array} \right. \begin{array}{r} \end{array}$$

| 14 feet. Ans.

307. How many cubic feet in a stone 12 feet long, 16 inches wide, and 9 inches thick?

$$\begin{array}{r} 12 \\ -16 -144 \\ \hline 9 \end{array}$$

12 feet. *Ans.*

308. How many cubic feet in a stone 18 feet long, 16 inches wide, and 4 inches thick?

$$\begin{array}{r} 18 \\ -8 -144 \\ \hline 4 \end{array}$$

8 feet. *Ans.*

309. How many cubic feet in a stone  $14\frac{2}{3}$  feet long, 15 inches wide, and 8 inches thick?

$$\begin{array}{r} 72 \\ -2 -144 \\ \hline 8 \end{array}$$

12 feet. *Ans.*

310. How many cubic feet in a stone 20 feet long, 36 inches wide, and 4 inches thick?

$$\begin{array}{r} 20 \\ -4 -144 \\ \hline 4 \end{array}$$

20 feet. *Ans.*

311. If  $\frac{1}{3}$  of 6 be three, what will  $\frac{1}{4}$  of 20 be?

$$\begin{array}{r} 1 \\ 20 \cdots 5 \\ 1 \mid 3 \\ 2 \mid 6 \end{array}$$

$2 \mid 15 = 7\frac{1}{2}$  *Ans.*

312. If 14 yards of cloth cost 40 dollars, what will  $\frac{1}{2}$  of a yard cost?

$$\begin{array}{r} 7 \\ -8 \mid 40 \cdots 5 \\ 2 \mid 5 \end{array}$$

$2 \mid 5 = \$2,50$  cts. *Ans.*

313. If  $\frac{1}{8}$  of a yard cost  $\$2\frac{1}{2}$ , what will 14 yards cost?

$$\begin{array}{r} -7 \mid 14 \quad 2 \\ \hline -2 \mid 8 \\ \hline -2 \mid 5 \\ \hline \end{array}$$

| \$40 *Ans.*

314. If 40 dollars buy 14 yards, how many yards will  $2\frac{1}{2}$  dollars buy?

$$\begin{array}{r} -2 \mid 5 \\ 8 \mid 40 \quad 14 \quad 7 \\ \hline \end{array}$$

8 | 7 =  $\frac{7}{8}$  of a yd. *Ans.*

315. If  $2\frac{1}{2}$  dollars buy  $\frac{7}{8}$  of a yard of cloth, how many yards will 40 dollars buy?

$$\begin{array}{r} -5 \mid 40 \quad 5 \\ -5 \mid 2 \\ -8 \mid 7 \\ \hline \end{array}$$

| 14 yds. *Ans.*

316. What is the interest of 73 cents for 100 days, at 5 per cent.?

$$\begin{array}{r} 1 \ 00 \mid 73 \quad - \\ -73 \mid 365 \quad 1 \ 00 \quad - \\ \hline \end{array}$$

| 1 ct. *Ans.*

317. What is the interest of 3 dollars 65 cents for 100 days, at 8 per cent. per annum?

$$\begin{array}{r} 1 \ 00 \mid 365 \quad - \\ -365 \mid 1 \ 00 \quad - \\ \hline \end{array}$$

| 8 cts. *Ans.*

318. What is the interest of 40 dollars for 8 months, at 6 per cent.?

$$\begin{array}{r} 1 \mid 40 \\ -2 \mid 8 \quad 4 \\ -2 \mid 6 \quad - \\ \hline \end{array}$$

| \$1,60 cts. *Ans.*

319. What is the interest of one cent for 100 years, at 7 per cent.?

$$\begin{array}{r} -100 \\ 1 \\ \hline 7 \\ \hline \end{array} \quad \begin{array}{r} 1 \\ 100--- \\ 7 \\ \hline \end{array}$$

| 7 cts. *Ans.*

320. What is the interest of 72 dollars for 1 month, at 3½ per cent.?

$$\begin{array}{r} 1 \\ -12 \\ \hline -2 \\ \hline \end{array} \quad \begin{array}{r} 72--- 6--- 3 \\ 1 \\ \hline 7 \\ \hline \end{array}$$

| 21 cts. *Ans.*

321. What is the interest of 96 dollars for 4 months, at 2 per cent.?

$$\begin{array}{r} 1 \\ -12 \\ \hline -2 \\ \hline \end{array} \quad \begin{array}{r} 96--- 8 \\ 4 \\ \hline 2 \\ \hline \end{array}$$

| 64 cts. *Ans.*

322. What is the interest of 6 dollars for 6 months, at 6 per cent.?

$$\begin{array}{r} 1 \\ -2 \quad -12 \\ \hline \end{array} \quad \begin{array}{r} 6 \\ 6--- 3 \\ 6--- \\ \hline \end{array}$$

| 18 cts. *Ans.*

323. A merchant in London has credit for 500 piasters in Leghorn, for which he can draw directly at 52 pence sterling per piaster: but choosing to have it remitted by a circular route, they are sent, by his order, to Venice at 95 piasters for 100 ducats banco; from thence to Cadiz at 350 maravadias per ducat banco; from thence to Lisbon at 630 reas per piaster of 272 maravadias; from thence to Amsterdam at 48 pence Flemish for 400 reas; from thence to Paris at 54 pence Flemish per crown; and from thence to London at 30 pence sterling per crown. What is the arbitrated price be-

tween London and Leghorn per piaster, and what is gained or lost by this circular remittance, without reckoning expenses?

$  \begin{array}{r}  19 \quad 95 \\  \quad \quad 1 \\  68 \quad 136 \quad 272 \\  \quad \quad \quad 35 \ 0 \\  \quad \quad \quad 400 \quad 630 \quad 7 \\  \quad \quad \quad \quad 6 \quad 54 \quad 48 \quad 4 \\  \hline  500 \quad 25 \quad 1 \quad 1 \\  52 \quad 26 \quad 13 \quad 30 \quad 5 \\  \hline  3 \quad 6 \quad 12 \quad 1 \quad 1 \\  \quad \quad \quad 20 \quad 20 \quad 1  \end{array}  $	$  \begin{array}{r}  5 \ 00 \\  100 \quad 50 \quad 25 \\  35 \ 0 \\  630 \quad 7 \\  48 \quad 4 \\  \hline  1 \\  30 \quad 5 \\  1 \\  1  \end{array}  $
$3 \mid 325 = \text{£}108\frac{1}{3}$	$1292 \mid 153125 = \text{£}118\frac{669}{1292}d.$
Amount received, or circular remittance, 500 piasters, at 52 pence,	$  \begin{array}{r}  118 \ 10 \ 4\frac{1}{2} \\  108 \ 6 \ 8  \end{array}  $
Gained by circular remittance,	$  \begin{array}{r}  \text{£}10 \ 3 \ 8\frac{1}{2} \\  \hline  \end{array}  $
Arbitrated value of a piaster by ditto,	$  \begin{array}{r}  56\frac{177}{600}d. \\  \hline  \end{array}  $

### SQUARE ROOT.

THE square of a number is the product arising from a number multiplied into itself.

The extraction of the square root is the finding of such a number as, being multiplied by itself, will produce the number proposed.

*Rule.* Separate the given number into periods of two figures each, beginning at the units' place.

Subtract from the first period at the left hand the greatest square it contains, setting the root of that square as a quotient figure, and doubling said root for a divisor, and bring down the second period to the remainder for a dividend.

Try how often the said divisor (with the figure used in the trial thereto annexed) is contained in the dividend, and set this figure in both the divisor and root; then multiply and subtract, as in Division, and bring down the next period. Double the ascertained root for a new divisor, and repeat the process to the end.

*Proof.* Square the root, adding in the remainder, if any, and the result will equal the given number.

## EXAMPLE.

What is the square root of 30138,696025 ?

$$\begin{array}{r}
 1 ) \overset{.}{3} \overset{.}{0} \overset{.}{1} \overset{.}{3} \overset{.}{8}, \overset{.}{6} \overset{.}{9} \overset{.}{6} \overset{.}{0} \overset{.}{2} \overset{.}{5} (173,605 \\
 1 \quad 1 \\
 \hline
 27) \quad 201 \\
 7 \quad 189 \\
 \hline
 343) \quad 1238 \\
 3 \quad 1029 \\
 \hline
 3466) \quad 20969 \\
 6 \quad 20796 \\
 \hline
 347205) \quad 1736025 \\
 1736025 \\
 \hline
 \end{array}$$

## CUBE ROOT.

THE cube of a number is the product of that number multiplied by its square.

The extraction of the cube root is the finding of such a number as, being multiplied into its square, will produce the number proposed.

*Rule.* Point off the given numbers into periods of three figures each, and find the nearest cube to the first period ; subtract it therefrom, and put the root in the quotient ; then thrice the square of this root will be the trial divisor for finding the next figure.

Set off a little to the left the next figure, with thrice the preceding figure of the root ; multiply this by the preceding figure, and set this under the trial divisor, remove it two figures to the right, and the sum will be the true divisor.

Under this divisor put the square of the last period figure of the root, which add to the two sums above, and the sum will be the trial divisor for finding the next figure of the root ; then the true divisor is found, as before.

## EXAMPLES.

What is the cube root of 205379 ?

$$\begin{array}{r}
 3 \times 5^2 = 75 \\
 159 \dots 1431 \\
 \hline
 8931
 \end{array}
 \qquad
 \begin{array}{r}
 205379(59 \\
 125 \\
 \hline
 80379 \\
 80379 \\
 \hline
 \end{array}$$

What is the cube root of 122615327232 ?

$$\begin{array}{r}
 3 \times 4^2 = 48 \\
 129 \dots 1161 \\
 \hline
 5961 \\
 81 \\
 \hline
 7203 \\
 1476 \dots 8856 \\
 \hline
 729156 \\
 36 \\
 \hline
 738048 \\
 17888 \dots 119104 \\
 \hline
 73923904 \\
 \hline
 \end{array}
 \qquad
 \begin{array}{r}
 122615327232(4968 \\
 64 \\
 \hline
 58615 \\
 53649 \\
 \hline
 4966327 \\
 4374936 \\
 \hline
 591391232 \\
 591391232 \\
 \hline
 \end{array}$$

Require to extract the cube root of 2205 to 19 places.

507	2205(13,01575997906296270
3901 . . . ,3901	2197
507,3901	8
,0001	5073901
507,7803	2926099
39,035 . . . 195175	2539877375
507,975475	386221625
25	355738604893
508, 17075	30483020107
39,0457 . . . 2733199	25411364591375
508, 19800699	5071655515625
49	4574066360515
508, 22533947	497589155110
39,04715 . . . 19523575	457406983963
508, 2272918275	40182171147
25	35576101403
508, 2292441875	4606069744
39,0,4,7,4,5,9, 3514253	4574070209
508,229595612,8	31999535
	30493801
508,229947038	
35143	1505734
	1016460
508,22998218,1	
	489274
508,23001732	457407
273	
	31867
508,2300200,5	30494
508,2300228	1373
4	1016
5,0,8,2,3,0,0,2,3,2	357
	355

## PROMISCUOUS QUESTIONS.

1. If the tuition of three boys for two quarters of a year be \$40,20 cts., how much will be the tuition of 60 boys for  $4\frac{1}{2}$  years ? *Ans. \$72,36 cts.*
2. An usurer put out \$186, to receive interest for the same ; and when it had continued 8 months he received for principal and interest \$193,44 cts. ; I demand at what rate per cent. per annum he received interest ? *Ans. 6 per cent.*
3. If 3 masters, who have each 8 apprentices, in 5 weeks, each week 6 days, earn \$360, how much will 5 masters, who have each 10 apprentices, earn in 8 weeks, each week  $5\frac{1}{2}$  days, their daily wages being the same, the masters working as well as apprentices ? *Ans. \$1075,55 cts.*
4. If 145 men can make a wall 32 feet high and 40 feet long in 8 days, in how many days can 68 men build a wall 28 feet high and of the same length ? *Ans. 14 $\frac{1}{2}$  days.*
5. What is the interest of \$538 for 3 years, at 7 per cent. ? *Ans. \$112,98 cts.*
6. What is the interest of \$375,17 cts. 6 m. for 4 years, at 7 per cent. ? *Ans. \$105,04 cts. 9 m.*
7. What is the interest of \$438,25 cts. for 5 years, at 6 per cent. ? *Ans. \$131,47 $\frac{1}{2}$  cts.*
8. What is the interest of a bond of \$875,35 cts. for  $5\frac{1}{2}$  years, at 6 per cent. per annum ? *Ans. \$288,86 $\frac{1}{2}$  cts.*
9. What is the interest of \$1711,15 cts. for 2 years, at  $5\frac{3}{4}$  per cent. ? *Ans. \$196,78 cts. 2 m.*
10. What is the amount of a mortgage of \$1256, which has continued 4 years, at 6 per cent. ? *Ans. \$1557,44 cts.*
11. What is the interest of \$453,45 cts. for 3 years and 4 months, at 6 per cent. ? *Ans. \$90,69 cts.*
12. What is the interest of \$394 for 56 days, at 6 per cent. ? *Ans. \$3,62 cts. 6 m.*
13. What is the interest of \$438,24 cts. for 4 years 9 months and 14 days, at 7 per cent. ? *Ans. \$146,90 cts. 7m.*
14. What is the difference between the interest of \$1204 at 5 per cent. per annum for 8 years, and the discount of the same sum for the same time and rate per cent. ? *Ans. \$137,60 cts.*
15. K is indebted to L a certain sum, which is to be discharged at 4 several payments ; that is,  $\frac{1}{2}$  at 2 months,  $\frac{1}{2}$  at 4 months,  $\frac{1}{2}$  at 6 months, and  $\frac{1}{2}$  at 8 months ; but they agree to

make one payment of the whole : the equated time is required.

*Ans. 5 months.*

16. A merchant purchased goods to the amount of \$2000, whereof \$400 are to paid present, \$800 at 5 months, and the rest at 10 months ; but they agree to make one payment of the whole ; what is the equated time ? *Ans. 6 months.*

17. How much tea, at \$1,12½ cts. a pound, can I have in barter for 4 cwt. 2 qrs. of chocolate, at 50 cents a pound ?

*Ans. 2 cwt.*

18. Suppose C has tea at \$1,06 cts. a pound ready money ; but in barter he will have \$1,25 cts. a pound ; and D has tobacco worth 18 cts. a pound ready money ; how much must he rate his tobacco a pound to equal the tea in value ?

*Ans. 21 cts.*

19. A had 41 cwt. of iron, at 30 shillings a cwt., for which B gave him £20 in money, and the rest in pork, at 5 pence a pound ; how much pork must he give besides the £20 ?

*Ans. 1992 lbs.*

20. A and B barter ; A has 320 pounds of chocolate, at 56 cts. a pound, for which B is to give him \$75 in money, and the rest in cotton, at 8 cts. a pound ; how much cotton must A receive ?

*Ans. 1302½ lbs.*

21. A and B barter ; A has 41 cwt. of hops, at \$4½ a cwt., for which B gave him \$28½ in money, and the rest in salt, at 80 cts. a bushel ; how much salt must B give A besides the \$28½ ?

*Ans. 195 bushels.*

22. A merchant bought 53 yards of silk, at \$1½ a yard, and afterward sold it at \$1¾ a yard ; how much did he gain by the sale ?

*Ans. \$13,25 cts.*

23. A merchant bought 650 pounds of sugar, at 10 cents a pound, and sold it at 12 cents a pound ; how much did he gain ?

*Ans. \$13.*

24. Bought a piece of baize of 42 yards for \$11,81 cts., and sold it at 31 cents a yard ; what is the gain on the whole piece ?

*Ans. \$1,21 cts.*

25. If one pound of tobacco costs 16 cents, and be sold for 20 cents, what is the gain per cent. ?

*Ans. \$25.*

26. If I buy tea at \$1 a pound, and sell it at 87½ cents a pound, what is the loss per cent. ?

*Ans. 12½ per cent.*

27. How much per cent. is equal to 3 shillings and 6 pence on a pound ?

*Ans. 17½ per cent.*

28. Bought a piece of shalloon, containing 34 yards, at 40

cents a yard, and sold it at  $12\frac{1}{2}$  per cent. loss; how much a yard was it sold for ? *Ans. 35 cts.*

29. Having sold a yard of cloth at 11s 6d, I gained at the rate of 15 per cent.; but if I had sold it for 12s, what should I have gained per cent.? *Ans. 20 per cent.*

30. Bought a chest of tea, weighing 490 lbs., for \$326, and sold it for \$370,10 cts.; what was the profit on each pound? *Ans. 9 cts.*

31. A captain, mate, and 16 seamen took a prize worth \$4056, of which the captain is to have 11 shares, and the mate 6 shares; the remainder is to be equally divided among the sailors; how much is each person to receive?

*Ans.*  $\left\{ \begin{array}{l} C. \$1352,00 \text{ cts.} \\ M. 737,45. \\ \text{Each S. } 122,90. \end{array} \right.$

32. Two men depart both from the same place, and travel the same road, the one 37 miles, and the other 45 miles every day. I demand how many miles they are distant from each other the 12th day after their departure? *Ans. 96 miles.*

33. How much will 4 pieces of linen, containing  $35\frac{1}{2}$ , 36,  $37\frac{1}{2}$ , and 38 yards, come to, at 79 cents a yard?

*Ans. \$116,13 cts.*

34. Bought 40 tubs of butter, weighing 36 cwt. 2 qrs. 14 lbs. neat, for \$472,05 cts.; paid cooperage 12 cents a tub; salt and labour, \$4,82 cts. 8 mills; storage, \$6,46 cts.: I would know what it stands me in a pound?

*Ans. 11 cts. 9 mills.*

35. How many quintals of fish, at \$2 a quintal, will pay for 140 tierces of salt, a \$4,70 cts. a tierce? *Ans. 329 qts.*

36. If 1 cwt. of flax costs \$15,75 cts., what is that a pound?

*Ans. 14 cts. +*

37. If a debt of \$120, due as follows, viz., \$50 at 2 months, \$40 at 5 months, and the rest at 7 months, be reduced to one payment, at what time must it be paid?

*Ans. 4 $\frac{1}{4}$  months.*

38. A gentleman sent a tankard to his goldsmith that weighed 50 ounces 8 pennyweights, and ordered him to make it into spoons, each to weigh 2 ounces 16 dwt.; how many spoons were made of the tankard? *Ans. 18 spoons.*

39. A gentleman, dying, left £963 18s to be divided in the following manner, viz., to his widow he gave one-third part, and the remainder was to be divided equally among six children; what was each one's portion?

*Ans. £321 6s, widow's; £107 2s, child's.*

40. A tub, which holds 130 gallons, is supplied by a pipe which admits 16 gallons into it in 30 minutes ; it also has a leak in the bottom, which lets out ten gallons in the same time ; now, if the water begins to come into the tub when it is empty, in what time will it be filled ? *Ans. 10½ hours.*

41. Some sportsmen having placed a fox 100 yards distant from 2 hounds, let them start together ; the hounds ran  $2\frac{1}{4}$  times faster than the fox : I demand how far the fox ran before the hounds overtook him ? *Ans. 66 $\frac{2}{3}$  yards.*

42. If I buy cloth for 75 cents a yard, how must I sell it a yard to gain 25 per cent. ? *Ans. 93 cents 7½ mills.*

43. If a pole, perpendicular to the horizon, of 50 feet 11 inches in length, when the sun is on the meridian, casts a shadow 98 feet 6 inches long, what is the breadth of a river, running due east and west within 20 feet 6 inches on the north side of a steeple 300 feet 8 inches high, which at the same time casts the extremity of its shadow 30 feet 9 inches beyond the stream ? *Ans. 176 yds. 2 ft. 4 in.*

44. A merchant began to trade with \$25327 ; for 6 years together he cleared \$1253 per annum ; the next 5 years he cleared \$1729 per annum ; but the last 4 years had the misfortune to lose \$3019 per annum : what was he worth at the 15 years' end ? *Ans. \$294,14 cts.*

45. I sold a watch for \$50, and by so doing lost 17 per cent. ; whereas I ought, in trading, to have cleared 20 per cent. : how much was it sold under its value ?

*Ans. \$22,28 cents 8 mills.*

46. When hens are 9 shillings a dozen, what will be the price of 6 dozen of eggs, at two for three cents ?

*Ans. 48 cts.*

47. What weight will a person be able to raise, who presses with the force of 168 pounds on the end of an equi-poised handspike 100 inches long, which meets a convenient prop exactly  $7\frac{1}{2}$  inches from the end ? *Ans. 2072 lbs.*

48. If a lever be 100 inches long, what weight, lying  $7\frac{1}{2}$  inches from the end, resting on a pavement, may be moved with the force of 168 pounds lifting at the other end of the lever ? *Ans. 2240 lbs.*

49. Two boys are playing tag ; one boy has 6 rods the start, but the other boy can run 15 to his 13 : I demand how far the hindermost boy must run before he will overtake the other one ? *Ans. 45 rods.*

50. When I sell a yard of muslin at 15 pence, I gain 30

shillings by the price ; and when I sell the yard at 14 pence I gain 20 shillings by the same price : I demand how many yards the piece contained ? *Ans. 120 yds.*

51. When oats are 2 shillings a bushel and Indian corn 4 shillings a bushel, what will be the amount of 37 bushels of the provender, at 3 shillings a bushel ? *Ans. £5 $\frac{11}{20}$ .*

52. A certain apple tree will bear apples sufficient to make 55 gallons of cider in a year ; how much can be made in 6 years from an orchard consisting of 7 rows, and 11 trees in each row, supposing each tree to bear as well as that one ?

*Ans. 100 tons 3 hds. 21 gals.*

53. What is the present worth of \$5150, due in  $4\frac{1}{2}$  months, discounting at the rate of 8 per cent. per annum, and allowing 1 per cent. on the present worth for prompt pay ?

*Ans. \$4950.*

54. The United States pay 6 per cent. interest on part of their domestic debt ; supposing they could borrow money in Holland for  $3\frac{1}{2}$  per cent., how much would they gain annually, by borrowing a million of dollars in Holland, and applying it to the payment of said debt ? *Ans. \$25000.*

55. There are 800 French crowns, at 4s 6d each, remitted to London by a merchant in Paris ; what is the value in pounds sterling ? *Ans. £180.*

56. In what time will £600 gain £50 interest, when £80 gain it in 15 years ? *Ans. 2 years.*

57. A and B depart from the same place, and travel the same road ; but A goes 5 days before B, at the rate of 20 miles a day ; B follows at the rate of 25 miles a day ; in what time and distance will he overtake A ?

*Ans. 20 days, and 500 miles.*

58. Astronomers compute the earth's orbit, or track which it describes round the sun in 365 days 6 hours, to be about 596,900,000 miles ; how far, then, a minute must we be carried through the firmament by this wonderful motion ?

*Ans. 1134 miles.*

59. Bought 60 pieces of Holland for three times as many dollars, and sold them for four times as many ; but if they had cost me as much as I sold them for, what should I have sold them for, to have gained after the same rate ?

*Ans. \$320.*

60. If I buy tallow at \$35 a ton, how must I sell a ton, to gain by 10 tons as much as 1 ton cost ? *Ans. \$38\frac{1}{2}.*

61. As I was beating o'er the forest grounds,  
 Up starts a hare before my two grayhounds ;  
 The dogs, being light of foot, did fairly run  
 Unto her fifteen rods just twenty-one.  
 The distance that she started up before  
 Was fourscore sixteen rods just, and no more :  
 Now this I'd have you unto me declare,  
 How far they ran before they caught the hare.

*Ans.* 336 rods.

62. What are the solid contents of a round stick of timber of equal bigness from end to end, whose diameter is 28 inches and length 25 feet ?

*Ans.* 106 $\frac{129}{144}$  ft.

63. What are the solid contents of a square stick of timber of equal bigness from end to end, whose diameter is 21 inches and length 35 feet ?

*Ans.* 107 $\frac{27}{144}$  ft.

64. What are the contents of a tapering square stick of timber, 24 feet 9 inches long, 16 inches square at one end, and ending in a point at the other ?

*Ans.* 14 $\frac{1}{4}$  ft.

65. What are the contents of a tapering round stick of timber, 30 feet long, 18 inches in diameter at one end, and ending in a point at the other ?

*Ans.* 17 $\frac{2}{3}$  ft.

66. What are the contents of a tapering square stick of timber, whose larger end is 12 inches, whose less end 8 inches, and whose length is 30 feet.

*Ans.* 21 $\frac{1}{8}$  ft.

67. What are the solid contents of a tapering square stick of timber, whose larger end is 15 inches, whose less end 9 inches, and whose length is 27 feet ?

*Ans.* 27 $\frac{9}{16}$  ft.

68. What are the solid contents of a round stick of timber, whose diameter at the larger end is 12 inches, at the smaller end 9 inches, and whose length is 30 feet ?

*Ans.* 18 $\frac{23}{144}$  ft.

69. What are the solid contents of a round block of marble, whose diameter at the larger end is 23 inches, and at the smaller end 15 inches, and whose length is 34 feet 8 inches ?

*Ans.* 69 $\frac{37}{144}$  ft.

70. If the diameter of a round stick of timber be 18 inches and its length 30 feet, how many solid feet will it contain when hewn square ?

*Ans.* 33 $\frac{3}{4}$  ft.

71. If a round stick of timber, 28 feet long and 22 inches diameter, be hewn square, how many solid feet will it contain ?

*Ans.* 47 $\frac{1}{18}$  ft.

72. How many feet of square-edged boards, 1 $\frac{1}{2}$  inches thick, including the saw gap, can be sawn from a log 16 feet long and 18 inches in diameter ?

*Ans.* 144 ft.

73. How many feet of square-edged boards,  $1\frac{3}{4}$  inches thick, including the saw gap, may be sawn from a log 28 feet long and 24 inches in diameter ? *Ans.* 384 ft.

74. How many feet are contained in a board 16 feet long and 15 inches broad. *Ans.* 20 ft.

75. How many feet are contained in the following lot of boards : 14 boards, 15 feet long 13 inches wide ; 8 boards, 17 feet long, 17 inches wide ; 23 boards, 18 feet long 11 inches wide ? and what is their value at \$13 $\frac{1}{2}$  a thousand feet ? *Ans.* 799 $\frac{1}{4}$  ft., and \$10,79 cts.

76. If  $\frac{2}{3}$  of a yard cost  $\frac{1}{2}$  of a £, what will 40 $\frac{2}{3}$  yards come to ? *Ans.* £59 8s 6 $\frac{1}{2}$  d.

77. If  $\frac{3}{4}$  of a yard of lawn cost 73 $\frac{3}{8}$  cts., what will 10 $\frac{1}{2}$  yards come to ? *Ans.* \$10,10 cts. 9 m.

78. At 12 $\frac{1}{2}$  cents a lb., what will 4 $\frac{1}{2}$  lbs. of cheese cost ? *Ans.* 55 $\frac{7}{8}$  cts.

79. If 2 oz. of silver cost 16s 5d, what cost  $\frac{3}{4}$  of an oz. ? *Ans.* 6s 1d 3 $\frac{1}{2}$  qrs.

80. If \$1 be worth 56 $\frac{3}{5}$ d, what are \$500 worth ? *Ans.* £117 18s 4d.

81. If 8 lbs. of sugar cost 4s 9 $\frac{3}{5}$ d, how much is it a lb. ? *Ans.* 7 $\frac{1}{5}$  pence.

82. If  $\frac{2}{3}$  of an ell English be worth  $\frac{2}{3}$  of \$2,28 cts., what is the value of 7 ells ? *Ans.* \$17,73 $\frac{1}{3}$  cts.

83. If  $\frac{1}{8}$  of a ship be worth \$175,35 cts., what part of her may be purchased for \$601,20 cts. ? *Ans.*  $\frac{2}{3}$ .

84. A person having  $\frac{1}{3}$  of a coal mine, sells  $\frac{1}{2}$  of his share for £171 ; what is the whole valued at ? *Ans.* £380.

85. A merchant had 5 $\frac{3}{8}$  cwt. of sugar, at 6 $\frac{1}{2}$  cts. a pound, which he bartered for tea at \$1 $\frac{5}{8}$  a pound ; how much tea did he receive for his sugar ? *Ans.* 27 lbs.

86. When wheat is at 66 cents a bushel, if the penny loaf weighs 7 ounces, what is it a bushel when the penny loaf weighs 2 $\frac{1}{2}$  oz. ? *Ans.* \$1,84 cts. 8 m.

87. If 9 students spend \$25 $\frac{1}{2}$  in 18 days, what sum will 20 students spend in 30 days ? *Ans.* \$95,47 cts.

88. If 3 men receive \$8 $\frac{9}{10}$  for 19 $\frac{1}{2}$  days' labour, how much must 20 men have for 100 $\frac{1}{4}$  days ? *Ans.* \$305,03 cts.

89. A certain pavement is made exactly square, and each side of it contains 97 feet : I demand how many square feet are contained therein ? *Ans.* 9409 square ft.

90. A certain square pavement contains 20736 square

stones, all of the same size ; what number is contained in one of its sides ? *Ans. 144 stones.*

91. A certain number of men gave \$3,61cts. for a charitable purpose ; each man gave as many cents as there were men : how many men were there ? *Ans. 19 men.*

92. If 484 trees be planted in a square orchard, how many trees must there be in a row each way ? *Ans. 22 trees.*

93. The wall of a certain fortress is 17 feet high, which is surrounded by a ditch 20 feet in breadth ; how long must a ladder be to reach from the outside of the ditch to the top of the wall ? *Ans. 26,24 ft.*

94. A line of 36 yards long will exactly reach from the top of a fort to the opposite bank of a river, known to be 24 yards broad ; the height of the wall is required.

*Ans. 26,83 yds.*

95. Suppose a ladder, 60 feet long, be so planted as to reach a window 37 feet from the ground on one side of the street, and, without moving it at the foot, will reach a window 23 feet high on the other side ; what was the breadth of the street ? *Ans. 102,64 ft.*

96. If a pipe, whose diameter is  $1\frac{1}{2}$  inches, fill a cistern in 5 hours, in what time will a pipe, whose diameter is  $3\frac{1}{4}$  inches, fill the same ? *Ans. 54 $\frac{3}{5}$  minutes.*

97. Admit a leaden pipe,  $\frac{3}{4}$  inch diameter, will fill a cistern in 3 hours ; I demand the diameter of another pipe which will fill the same cistern in one hour ? *Ans. 1 $\frac{3}{10}$  in.*

98. Suppose a cellar to be dug that shall be 12 feet every way, in length, breadth, and depth ; how many solid feet of earth must be taken out to complete the same ?

*Ans. 1728 ft.*

99. Jacob, by contract, was to serve Laban for his two daughters 14 years ; and when he had accomplished 11 years, 11 months, 11 weeks, 11 days, 11 hours, and 11 minutes, how long had he to serve ?

*Ans. 1 y. 11 mo. 3 w. 2 d. 12 h. 49 m.*

100. A merchant laid out £691 4 shillings in cloths, but forgot the number of pieces purchased, also how many yards were in each piece, and what they cost him a yard ; but he remembers that they cost him as many shillings a yard as there were yards in each piece, and that there was just as many pieces : query, the number purchased ?

*Ans. 24 pieces.*

101. The circular winchester bushel is  $18\frac{1}{2}$  inches over

and 8 inches deep. How many bushels of grain will a square bin hold that is 7 feet 10 inches long, 3 feet 10 inches broad, and 4 feet 2 inches deep ? *Ans. 100*1*/₂*.

102. If the human heart beat 70 times in a minute, and each pulsation transmit 4 oz. (Avoirdupois) of blood, and the whole blood be  $\frac{1}{70}$  part of the weight of the body, in what time will the whole blood of a man, whose weight is 140 lbs., circulate through the heart ? *Ans. 24 sec.*

103. How many trees may be planted on an acre of ground, at the distance of 6 feet from each other ? *Ans. 1210.*

104. If a cow yield 20 quarts of milk in a day for 240 days, and 25 quarts make one pound of butter, how many pounds of butter will be obtained in the season, and what does it come to at 15 cents a pound ?

*Ans. 192 lbs., \$28,80 cts.*

105. Admitting the Hudson River to be 1000 feet broad and 10 feet deep, and to run at the rate of 4 miles per hour ; in what time will it discharge a cubic mile of water (reckoning 5000 feet to the mile) into the sea ?

*Ans. 26 days 1 hour.*

106. A stone is 4 feet 6 inches long, 2 feet 9 inches broad, and 3 feet 4 inches thick ; how many solid feet does it contain ? *Ans. 41*1*/₄ feet.*

107. A room 30 feet long and 18 feet wide is to be covered with painted cloth ; how many yards  $\frac{3}{4}$  wide will cover it ?

*Ans. 80 yards.*

108. At the close of the American war the British government owed £280,000,000, and the pound sterling contains 3 oz. 17 dwt. 10 grs. of silver ; I demand the number of tons Avoirdupois, 7000 grains Troy being equal to one pound Avoirdupois ? I likewise wish to know how long a train of wagons it would take to carry the whole, a ton at a load, and 3 rods apart ?

*Ans. T.33178 11 cwt. 1 gr. 20 lbs., 311 miles 14 rods.*

109. A water tub holds 147 gallons ; the pipe usually brings in 14 gallons in 9 minutes ; the tap discharges at a medium 40 gallons in 31 minutes ; now, supposing the tap to be carelessly left open, and the water to be turned on at 2 o'clock in the morning ; a servant at 5, finding the water running, shuts the tap, and is solicitous to know in what time the tub will be filled after this accident ; require the time ?

*Ans. 3 m. 48 sec. past 6 o'clock.*

110. Twenty knights, 30 merchants, 24 lawyers, and 24 citizens, spent at a dinner £64, which sum was divided among them in such a manner that 4 knights paid as much as 5 merchants, 10 merchants as much as 16 lawyers, and 8 lawyers as much as 12 citizens ; the question is, to know the sum of money paid by all the knights ; also by the merchants, lawyers, and citizens ?

Ans. 

Knights,	£20.
Citizens,	8.
Merchants,	24.
Lawyers,	12.

111. A hare starts 12 rods before a hound, but is not perceived by him until she has been up 45 seconds ; she scuds away at the rate of 10 miles an hour ; and the dog, on view, makes after her, at the rate of 16 miles an hour ; how long will the course hold, and what space will be run over from the spot where the dog started ? Ans. 2288 ft.,  $97\frac{1}{2}$  sec.

112. B owes £2119 17s 6d, and he is worth but £1324 18s 5 $\frac{1}{4}$ d ; if he delivers this to his creditors, how much do they receive on the pound ? Ans.  $12\frac{1}{2}$  shillings.

113. A merchant bought a parcel of cloth at the rate of \$1 for every 2 yards, of which he sold a certain quantity at the rate of \$3 for every 5 yards, and then found he had gained as much as 18 yards cost : how many yards did he sell ?

Ans. 90 yds.

114. If  $\frac{3}{16}$  of a ship cost £273 2s 6d, what are  $\frac{5}{32}$  of her worth ? Ans. £227 12s 1d.

115. If  $3\frac{1}{4}$  yards of cloth that is  $1\frac{1}{2}$  yards wide be sufficient to make a cloak, how much must I have of that sort which is  $\frac{1}{2}$  yard wide, to make another of the same size ?

Ans. 47 yds.

116. If 3 men can do a piece of work in  $4\frac{1}{2}$  hours, in how many hours will 10 men do the same work ? Ans.  $1\frac{7}{20}$  hours.

117. A man had two silver cups of unequal weight, having but one cover to both, 5 ounces ; now if the cover is put on the less cup, it will be double the weight of the greater cup ; and if put on the greater cup, it will be three times as heavy as the less cup : what is the weight of each cup ?

Ans. 3 oz. less cup. 4 oz. greater.

118. A person being asked in the afternoon what o'clock it was, answered that the time past from noon was equal to  $\frac{2}{3}$  of the time to midnight ; require the time ?

Ans. 36 m. past one.

119. A man and his wife can drink out a cask of beer in

12 days ; but when the man was from home, it lasted the woman 30 days : how many days would the man be drinking it alone ?

*Ans. 20 days.*

120. A stationer sold quills at 11 shillings per thousand, by which he cleared £60 per cent. ; but growing scarce, he raised them to 13 shillings 6 pence per thousand : what was his gain per cent. by the latter price ?

*Ans. £96 7s 3 $\frac{3}{11}$ d.*

121. After a certain number of men had been employed on a piece of work for 24 days, and had half finished it, 16 men more were set on, by which the remaining half was completed in 16 days ; how many men were employed at first, and what was the whole expense at 1 $\frac{1}{2}$  shillings per day for each man ?

*Ans. 32 men. £115 $\frac{1}{2}$ .*

122. From each of 16 pieces of gold a person filed the worth of half a crown, and then offered them in payment for their original value ; and the fraud being detected, and the pieces weighed, they were found to be worth in the whole no more than 8 guineas : what was the original value of each piece ?

*Ans. 13 shillings.*

123. If 12 oxen will eat 3 $\frac{1}{3}$  acres of grass in 4 weeks, and 21 oxen will eat 10 acres in 9 weeks, how many oxen will eat up 24 acres in 18 weeks, the grass being allowed to grow uniformly ?

*Ans. 36 oxen.*

124. A footman agreed to serve his master 12 months for \$180 and a livery of a certain value ; at the end of 7 months he was turned away, and received his livery and \$80,50 cts. in money ; what was the prime cost of his livery ?

*Ans. \$58,80 cts.*

125. C owes D \$1400, to be paid in 3 months ; but, D being in want of money, C pays him at the expiration of 2 months \$1000 : how much longer than 3 months ought C, in equity, to defer the payment of the rest ?

*Ans. 2 $\frac{1}{4}$  months.*

126. A has tea, which he barters with B at 10 pence per lb. more than it cost him, against cambric which stands B in 10 shillings per yard, but he puts it at 12 shilling 6 pence : I would know the first cost of the tea ?

*Ans. 3 $\frac{1}{4}$  shillings.*

127. A and B barter some goods ; A puts his at 30 $\frac{9}{15}$  shillings, and gains 8 per cent. B puts his at 24 $\frac{3}{10}$  shillings, and gains at the same rate ; what was the first cost of the goods ?

*Ans. 28s, & 22s 6d.*

128. A and B barter ; A has cloth that cost 28 pence ; B's cost him 22 pence, and he puts it at 25 pence ; how high must A put his to gain 10 per cent. more than B ?

*Ans. 35d.*

129. A trader bought 1 hhd. of rum of a certain proof, containing 115 gallons, at \$1,10 cts. per gallon; how many gallons of water must he put into it to gain \$5 by selling it at \$1 per gallon? *Ans. 16½ gals.*

130. Bought rum at \$1,25 cts. per gallon, which, not proving so good as I expected, I am content to lose 18 per cent. by it; how must I sell it per gallon? *Ans. \$1,02½ cts.*

131. Bought 4 hhds. of rum, containing 450 gals., at \$1 per gal., and sold it at \$1,20 cts. per gal., and gave 3 months' credit; now, allowing the leakage of the rum, while in my possession, to be 10 gals., I would know the gain or loss, discounting for the present worth of the debt at 6 per cent.? *Ans. \$70,19 cts. gain.*

132. A vintner buys 596 gallons of wine, at 6s 3d per gallon, in ready money, and sells it immediately at 6s 9d per gallon, payable in 3 months: how much is his gain or loss, supposing he allows the interest for the time at 6 per cent. per annum, as discount for present payment? *Ans. £11 17s 8d.*

133. What would be the gain or loss on the aforesaid wine, supposing the discount for present payment to be made at 2 per cent., without any regard to time? *Ans. £10 17s 6d.*

134. H sells a quantity of corn at \$1 per bushel, and gains 20 per cent.; some time after he sold some of the same to the amount of \$37½, and gained 50 per cent.: how many bushels were there in the last parcel, and at what rate did he sell it per bushel? *Ans. 30 bush., \$1 1/4.*

135. A distiller is about purchasing 10,000 gallons of molasses, which he can have at 48 cents per gallon, in ready money, or 50 cents with 2 months credit; it is required to know which is more advantageous to him, either to buy it on credit, or to borrow the money at 8 per cent. per annum, to pay the cash price? *Ans. \$136 by paying.*

136. Three persons, A, B, and C, send a ship to Cuba, with indigo to the amount of \$473344; A bought 250 cwt. 1 qr. 22 lbs. at \$84 per cwt., B paid \$70 per cwt. for his. But meeting with a storm at sea, they lost part overboard; A's proportional part cast overboard was equal to the  $\frac{1}{10}$  part of the whole cargo, and  $3\frac{1}{3}$  times the whole quantity cast overboard was equal to  $3\frac{1}{3}$  times the whole cargo of A and B. When they came to land, A sold his remaining part for \$126 per cwt., and found himself the loser of 10 per cent., besides charges; B advanced the remaining part of his commodity 20 per cent.; and C gained \$7 per cwt. by the quantity he

sold. What did each person lose by this voyage, the charges whereof amounted to \$157,50?

Ans.	A's loss	\$2497,50.
	B's	90142,50.
	C's	47231,25.

137. C has nutmegs worth 7s 6d per lb. in ready money, but in barter he will have 8 shillings; D has tobacco worth 9 pence per pound; how much must he rate it per pound, that his profit may be equal to C's?

Ans. 9 $\frac{3}{4}$ d.

138. A, in a scuffle, seized on  $\frac{3}{4}$  of a parcel of sugar plums; B catched  $\frac{3}{4}$  of it out of his hands, and C laid hold on  $\frac{1}{16}$  more; D ran off with all A had left, except  $\frac{1}{4}$ , which E afterward secured slyly for himself; then A and C jointly set upon B, who, in the conflict, shed  $\frac{1}{2}$  he had, which were equally picked up by D and E, who lay perdue; B then kicked down C's hat, and to work they all went anew for what it contained, of which A got  $\frac{1}{4}$ , B  $\frac{1}{4}$ , D  $\frac{1}{2}$ , and C and E equal shares of what was left of that stock; D then struck  $\frac{3}{4}$  of what A and B last acquired out of their hands; they with difficulty recovered  $\frac{5}{8}$  of it in equal shares again, but the other three carried off  $\frac{1}{8}$  apiece of the same. Upon this they called a truce, and agreed that the  $\frac{1}{8}$  of the whole left by A at first should be equally divided among them: how much of the prize, after this distribution, remained with each of the competitors?

Ans.	A's part	2862
	B's	6335
	C's	2428
	D's	10294
	E's	4950
		28885

139. A lad got 4000 nuts; in his return home was met by Mad Tom, who took from him  $\frac{1}{8}$  of  $7\frac{2}{3}$  of his whole stock. Raving Ned lights on him afterward and forced  $\frac{2}{3}$  of  $\frac{1}{8}$  of the remainder from him; unluckily Positive Jack found him, and required  $1\frac{1}{5}$  of  $\frac{1}{2}$  of what he had left; Smiling Dolly was, by promise, to have  $\frac{1}{4}$  of  $\frac{1}{4}$  of what nuts he brought home; how many nuts, then, had the boy left?

Ans. 575 $\frac{5}{4}$  nuts.

140. In distress at sea, they threw out 17 hhds. of sugar, worth £34 per hhd., the worth of which came up to but  $\frac{4}{7}$  of the indigo they cast overboard; besides which, they threw out 13 iron guns, worth £18 10s apiece; the value of all amounted to  $\frac{2}{7}$  of  $1\frac{1}{3}$  of that of the ship and loading: what value came into port?

Ans. £4337 15s 6 $\frac{1}{4}$ d.

141. If, out of a cargo of 600 slaves, 200 die during a pas-

sage of 6 weeks from Africa to the West Indies, how long a passage will it take, that one-half of the cargo may be thus murdered, supposing the mortality to be the same throughout the passage, in proportion to the living. *Ans. 10½ weeks.*

142. A circular fish-pond is to be made in a garden that shall take up just half an acre ; what must be the length of the cord that strikes the circle ? *Ans. 27½ yds.*

143. What length of cord will fit to tie to a cow's tail, the other end fixed in the ground, to let her have liberty of eating an acre of grass, and no more, supposing the cow and tail to be 5½ yards ? *Ans. 6,136 rods.*

144. A and B have a certain number of dollars ; says A to B, multiply the square root of your dollars by mine, and the number will be \$180 ; and says B to A, multiply the square root of your dollars by mine, and it will be \$150 : how many dollars had each ? *Ans. A \$36. B \$25.*

145. A says to B, give me \$100, and I shall have as much as you. No, says B to A ; give me \$100, and I shall have twice as many as you. How much has each ? *Ans. A \$500. B \$700.*

146. Laid out in a lot of muslin £500 ; but, upon examination, 3 parts in 9 proved to be damaged, so that I could make but 5 shillings per yard on it ; and by so doing, find I lost £50 ; at what rate per ell must I sell the undamaged part, so that I may clear £50 by the whole ? *Ans. 11½ s.*

147. I would plant 10 acres of hop-ground, which must be done either in the square order, as the number 4 stands on the dice, or in the quincunx order, as the number 5 ; the three nearest bind in both cases ; must be set lineally just 6 feet asunder ; how many plants more will be required for the last order than for the first, admitting the form of the plot to lay the most advantageous for the plantation in either case ? *Ans. 1872.*

148. A reservoir for water has two cocks to supply it ; by the first alone it may be filled in 40 minutes, and by the second in 50 minutes ; it has likewise a discharging cock, by which it may, when full, be emptied in 25 minutes. Now, if these three cocks are left open when the water comes in, in what time will the cistern be filled, supposing the influx and efflux of the water to be always alike ? *Ans. 3h. 20m.*

149. Suppose the sea allowance for the common men to be 5 lbs. of beef and 3 lbs. of biscuit a day for a mess of 4 peo-

ple, and that the price of the first is  $2\frac{1}{2}$  pence per pound, and of the second  $1\frac{1}{2}$  pence ; now, if the ship's company be such that the meat they eat cost government 12 guineas per day, what must they pay for their bread per week ?

*Ans. £35 5 $\frac{1}{2}$ s.*

150. Out of a pipe of wine, containing 84 gallons, 10 gallons were drawn off, and the vessel replenished with water ; after which 10 gallons of the mixture were likewise drawn off, and then 10 gallons more of water were poured in, and so on for a third and fourth time ; which being done, it is required to find how much pure wine remained in the vessel, supposing the two fluids to have been thoroughly mixed each time ?

*Ans. 50,59284 gals.*

151. A traveller leaves Exeter at 6 o'clock on Monday morning, and walks toward London at the rate of 3 miles an hour without intermission ; another traveller sets out from London at 4 o'clock the same evening, and walks for Exeter at the rate of 4 miles an hour constantly ; now, supposing the distance between the two cities to be 130 miles, whereabouts on the road will they meet ? *Ans. 69 $\frac{3}{4}$  miles from Exeter.*

152. What part of 3 pence is a third part of two pence ?

*Ans.  $\frac{2}{3}$ .*

153. How many oaken planks will floor a barn  $60\frac{1}{2}$  feet long and  $33\frac{1}{2}$  feet wide, when the planks are 15 feet long and 15 inches wide ?

*Ans. 108 $\frac{7}{5}$  planks.*

154. Three merchants made a company ; A put in £150 for 14 months, B put in a certain sum for one year, and C put in £100 for a certain time ; some time afterward they found that their stock and profit together made £475, of which A took £195, B £153, and C £127 ; I demand how much B put in, and how long a time C's stock was in trade ?

*Ans. B put in £121 $\frac{3}{4}$ . C's was in 12 $\frac{1}{4}$  months.*

155. Bought 120 oranges 2 a penny, and 120 more at 3 a penny, and sold them all together at 5 for 2 pence ; what did I gain or lose by the bargain ?

*Ans. 4d loss.*

156. A and B, venturing equal sums of money, clear by joint trade £154 ; by agreement, A was to have 8 per cent., because he spent his time in the execution of the project, and B was only to have 5 ; what was A allowed for his trouble ?

*Ans. £35 10s 9 $\frac{3}{4}$ d.*

157. Suppose a man has a calf, which at the end of three years begins to breed, and afterward brings a female calf

every year, and that each calf begins to breed in like manner at the end of three years, bringing forth a female calf every year ; and that these last breed in the same manner, &c. ; to determine the owner's whole stock at the end of 20 years.

*Ans. Whole stock, 1278.*

158. A citizen, riding his rounds to receive money due to him, came to a place in which he had there debtors, A, B, and C ; but when he came to examine, he found he had lost his pocket-book, in which was each man's separate bill. Then sending for them all to an inn, he tells them his accident ; but they pretended they did not know what was due to him, having lost the bills that came with the parcels. The gentleman, thinking he had got some slippery chaps to deal with, endeavoured all he could to save himself the trouble of another journey ; and this he did from the following data : He remembered very well that A and B's debt together made \$270 ; A and C's debt together \$630 ; B and C's together made \$750. It is demanded what each man's particular debt was ?

*Ans.  $\begin{cases} A's \text{ debt, } \$75. \\ B's \text{ " } 195. \\ C's \text{ " } 555. \end{cases}$*

159. If 9 gentlemen or 15 ladies will eat 17 apples in 5 hours, and 15 gentlemen and 9 ladies can eat 47 apples of a similar size in 12 hours, the apples growing uniformly, how many boys will eat 360 apples in 60 hours, admitting that 120 boys can eat the same number as 18 gentlemen and 26 ladies ?

*Ans. 642 $\frac{2}{3}$  boys.*

160. How many crowns, of 110 cents each, will pay a debt of £82 16s 7d, New England ?

*Ans. 251 crowns.*

161. If 203 tons 9 cwt. 3 qrs. 3 lbs. of tallow cost £4558. 3s, what will 1 ton cost ?

*Ans. £22 $\frac{2}{3}$ .*

162. How many cwt. of rice may be bought for \$487 $\frac{1}{2}$ , when 7 lbs. cost 25 cts. ?

*Ans. 121 cwt. 3 qrs. 14 lbs.*

163. A captain of a ship is provided with 18000 lbs. of bread for 150 seamen, of which each man gets 4 lbs. per week ; how long will it last them ?

*Ans. 30 weeks.*

164. How long will 2295 pounds of beef last 45 seamen, if they get one pound each, and that three times a week ?

*Ans. 17 weeks.*

165. Suppose 120 seamen are provided with 7200 gallons of water for a cruise of 4 months, each month 30 days ; how much is each man's share per day ?

*Ans. 2 qts.*

166. A ship's company of 16 men is on allowance of 6 ounces of bread per day; when meeting with a vessel from which they are supplied with 2 cwt. of bread, what addition will this make to their daily allowance, if they suppose their voyage to last 28 days?

Ans. 8 oz.

167. A farm of 48 acres is owned, viz., A  $\frac{1}{3}$ , B  $\frac{1}{4}$ , C  $\frac{1}{5}$ , and D the remainder. What is D to receive for his part, if the whole was sold for \$918?

Ans. \$357.

168. A owns  $\frac{1}{4}$  of a farm of 108 acres, B  $\frac{1}{6}$  of it, C  $\frac{1}{5}$ , and D the remainder. If D sold his part for \$714, what was the farm valued at?

Ans. \$1836.

169. A owes B \$87,52, for which B agrees to take land at \$25,60 per acre. How much land is B to have?

Ans. 3 acres 1 rood 27 rods.

170. Two persons hired a coach in Boston, to go 40 miles, for \$20, with liberty to take in two more when they pleased. When they had gone 15 miles they admit C, who wished to go the same route; and on their return, within 25 miles of Boston, they admit D for the remainder of the journey. As each person is to pay in proportion to the distance he rode, it is required to settle the coach-hire between them?

Ans. { A and B \$6,40 cts. each.  
{ C 5,20 cts.  
{ D 2,00 cts.

171. A ship, on her passage from Amsterdam to New York, having received much damage in a gale, bore away for Ireland, where she arrived on the 5th of October; and having received the necessary repairs, was ready for sea on the 23d of December. Allowing \$377 per month for the wages of the captain and crew, and 33 $\frac{1}{3}$  cents each per day for 14 men, what did the whole amount to, in calculating the average?

Ans. \$1361,43. cts

172. The Chinese wall is said to be 1200 miles long, averaging 18 feet high and as many thick; how many solid fathoms does it contain?

Ans. 9,504,000 fathoms.

173. A pile of wood 84 feet 6 inches long, 22 feet 7 inches high, and 23 feet 10 inches wide, is sold at \$3,26 per cord; what is the amount?

Ans. \$1158,32 cts.

174. Required, the cost of a lot of land 62 feet 11 $\frac{1}{4}$  inches long and 27 feet 3 $\frac{1}{2}$  inches wide, at \$1,80 cts. per square foot.

Ans. \$3093,86 cts.

172. A of Providence has in his hands \$500 due to G of Charleston, for nett proceeds of his cotton; this is re-

mitted to G per bill on M in his favour, when bills on Charlest^{on} are at 2 per cent. discount. Required, the amount of the bill.

*Ans.* \$510,20 cts.

176. If iron, worth in cash \$4 per cwt., is sold for \$4,50 cts. on a credit of 8 months, what credit should be allowed on selling wine, worth in cash \$224 per pipe, but charged at \$242, to make the per centage equal to that on the iron?

*Ans.* 5½ months.

177. A bought a lot of flour for cash, and sold it to B at an advance; B sold it to C at 10 per cent. advance, and C, on selling it to D, gained \$71,28 cts., equal to 12 per cent. profit, which was 4 per cent. more than A made, though he bought it at \$5 per barrel. Required, B's gain, how much C received, and the number of barrels in the lot?

*Ans.* { *B gained \$54,00 cts.*  
*C received \$665,28.*  
*In the lot 100 barrels.*

178. What would be the duty on a piece of flannel 30 yards long and 42 inches wide, if it was estimated at 40 cents per square yard, and 30 per cent. *ad valorem*? and what per centage would it pay on the original cost, if charged at 15 pence sterling per yard?

*Ans. Duty \$4,20, and 50 per cent.*

179. Suppose a piece of baize 46 yards long and 26 inches wide, estimated at 40 cents per square yard, and 30 per cent. *ad valorem*; what would be the duty, and what per centage would it pay on the original cost, if charged at 27s sterling?

*Ans. Duty \$3,96 cts., and 66 per cent.*

180. A's commission, at 5 per cent., on a consignment of coffee was \$47,50 cts., by the gross sales of which the shipper made 25 per cent. profit. What was it invoiced at?

*Ans. \$760.*

181. A merchant, on selling certain goods on commission, charges 2½ per cent., and ½ per cent. for prompt payment of the nett proceeds. Suppose the latter amounts to \$3,3 mills, what was the commission?

*Ans. \$30,80 cts.*

182. How much money at interest at 6 per cent. per annum, from February 16th, 1825, would be sufficient to meet a custom-house bond of \$1464,45 cts., which becomes due on 10th of January, 1826?

*Ans. \$1389,52 ¾ cts.*

183. A man, for a wager of \$1000, having engaged to travel 17 miles in 1 hour 34½ minutes, finished 10 miles of

it in 1 hour  $\frac{1}{2}$  minute, and performed the task in 1 hour 31 minutes. It is required to know whether he was before or after time when he had travelled the 10 miles, and how much was he before time when he finished?

*Ans. 1555 yards after time at the end of ten miles,  
and 1108 yards before time when he finished.*

184. Suppose the town of B to be due east of the town of A, and the town of C due south of it an equal distance. If the distance in a straight line from B to C is 196 miles, what is the distance from B to A? *Ans. 138 m.*

185. G owns  $\frac{2}{3}$  of  $\frac{1}{2}$ , and  $\frac{2}{3}$  of  $\frac{1}{11}$  of the other  $\frac{1}{2}$  of an undivided estate in Boston. Suppose this estate rents for \$1556, 94 cts., being equal to 6 per cent. per annum on its value, and that he sells  $\frac{1}{2}$  of his part on such terms as to yield the purchaser 8 per cent. on his payment; how much does G receive, and what share has he now in the estate?

*Ans. He receives \$2148,37 $\frac{1}{2}$  cts., and owns  $\frac{17}{154}$  of it.*

186. A merchant tailor bought 40 yards of cloth,  $2\frac{1}{4}$  yards wide; but being made wet it shrank in length half a quarter upon every 4 yards, and in width one nail and a half upon every  $1\frac{1}{4}$  yards. To line this cloth, he bought baize 5 qrs. wide, which, being wet, did shrink the whole width on every 20 yards in length, and in width it shrank  $\frac{1}{2}$  a nail: required, the number of yds. of baize. *Ans. 71 $\frac{7}{13}$  yds.*

187. The circumference of the great bell at Moscow is 67 feet 4 inches; required, the area of the ground it covers where it lodges, and the side of a square equal to the area.

*Ans. 361 ft.  
side of the square=19 ft.*

188. A, on preparing for a voyage to Calcutta, purchased of G specie dollars to be paid in 18 months with interest. Supposing the premium on the dollars to be 3 per cent., and that G would have a compensation of 5 per cent. per annum for the use of his money, to be inserted in the note, which was given for \$22145; I would know the sum purchased?

*Ans. \$20000.*

189. Two merchants, B and C, trade together; B advances \$5000, and at the end of 4 months, being pressed for money to answer a demand, he takes out a certain sum, leaving the remainder to continue 8 months; C advances \$2500, and at the end of 5 months he finds it necessary to put in \$3000 more, and continues the whole 7 months longer, when they

close their business, and B finds he has gained \$1066 $\frac{1}{4}$  and C \$1333 $\frac{1}{4}$ . I would know how much B took out at the end of 4 months ?

Ans. \$2400.

190. G bought and sold for cash the following lots of flour, viz.; Jan. 1st he bought 50 bbls. at \$5,75 per bbl.; on 15th, 20 bbls. at \$5,60; on 16th he sold 65 bbls. at \$6,25; on 17th he bought 10 bbls. at \$6,75; June 5th he bought 16 bbls. at \$5,50; and on the 19th, 19 bbls. at \$6,80; on 5th August he bought 30 bbls. at \$6,50, and on the 25th he sold 68 bbls. at \$6,60; Sept. 12th he bought 43 bbls. at \$5,80; on 15th he sold 10 bbls. at \$6, and, on 18th, 30 bbls. at \$5,60; on 5th Oct. he bought 15 bbls. at \$6, and on 24th he sold 20 bbls. at \$6,12 $\frac{1}{2}$ . How many barrels has he on hand, and what is his gain or loss, estimating what remains at \$6,25 per barrel ?

Ans. 10 bbls.

Gain, \$49,45.

191. Two carpenters, A and B, who have each an apprentice, engage to finish a piece of work for \$630. By agreement between them, A's apprentice is to be allowed 62 $\frac{1}{2}$  cents per day, and B's 100 cents. When the work was finished, it appeared that A worked 120 days, and his apprentice 100; B worked 96, and his apprentice 135 $\frac{1}{2}$  days. Supposing that, while doing the work, they receive each \$210, what is each person's share of the remaining payment, on stating their accounts ?

Ans. A \$92,50 due.

B \$117,50 "

192. James and John have lived together 8 years in John's house, the rent of which is stated at \$50 per annum. James's bill for supplies is \$1546,46, and John's bill \$497,24, and he has James's note for \$560,80, without interest. Required, the balance on stating their accounts, and in whose favour ?

Ans. \$236,19 due John.

193. On 1st of May B of Boston had of H of Lowell 10 bbls. of flour at \$6,75 cts. per bbl., and paid him in part \$25 in cash. On 15th he had of H 31 gallons of molasses at 30 cts and a bbl. at 83 cts; 19th he delivered to H 30 qtls. of fish at \$2,50 cts, and took 20 yds. of baize at 50 cts; June 3d, B had 250 lbs. of coffee at 24 cts, and 10 lbs. of chocolate at 25 cts; July 27, B brought to H. 4 bbls. of oil at \$10, and 31st he sent to H 4 bbls. salmon, at \$10,50 cts, when H paid his order to J. M. for \$12,50 cts, and delivered per his order to D. L. 903 lbs. of sugar at 7 cts; Sept 6th, A paid B's note

to G for cordage, on which H was endorser, viz., for principal, \$65,94 cts., \$1,87 cts. for interest. On 10th B brought to him 5854 feet of boards, at \$11,50 cts. per thousand, and 10 barrels No. 1 mackerel, at \$5 ; a settlement was then made, and he was furnished with his account, and the balance paid in cash. What was the amount, and in whose favour ?

*Ans. \$5,67 cts. in favour of B.*

194. A, B, and C agreed on an entertainment, to which some friends were invited : A and B supplied the provisions, &c., in 8 baskets of equal cost. Five of which were supplied by A and three by B. When the entertainment was finished, C laid down \$12,64 cts for his part, which was to be shared by A and B ; but disagreeing in the division of it, they referred it to D, who awarded to each his part, and provide the justness of his decision by stating it in an account. Required, the amount awarded to each ?

*Ans. { A \$11,06 cts.  
B 1,58 cts.*

195. A person, failing in trade, owed to A \$100, B \$200, C \$400, to D \$350 ; and his property consisted of

33 $\frac{1}{2}$	yards Broadcloth,	worth \$5,75 cts. per yard,	
57 $\frac{1}{2}$	" Cassimere,	" 2,46	"
136 $\frac{1}{2}$	" Linen,	" .86	"
229 $\frac{1}{2}$	" Flannel,	" .38	"
58	lbs Tea,	" 1,20	per lb
254	" Sugar,	" .09	"
5	bbls Flour,	" 5,75	per bbl.,

which was assigned for benefit of his creditors. The commission on sale of the goods, at the appraised value, was at 2 $\frac{1}{2}$  per cent., and the assignee's bill \$43,50 cts. : on exhibiting their statement to the creditors and paying the dividends, how much was there paid to each, and how much did he pay on the dollar ?

*Ans. { To A \$57,14 cts. } \$57,14  
" B 114,29 cts. } \$114,29  
" C 228,57 cts. } \$228,57  
" D 200,00 cts. } \$200,00*

196. G, being employed in working for E, at \$1,25 cts. per day, takes the following articles, viz. :

May 1, took a barrel of Flour, at \$6,75 cts.

June 29, " 14 lbs. Sugar, for 1,50 cts.

July 17, " 20 yds Sheeting, at 30 cts per yard.

" 25, " 12 lbs. Butter, " 14 cts per lb.

" 26, " 1 " Tea, " 90 cts per lb.

Aug. 23d received \$20 in cash per receipt ; Sept. 19th took 3 yds. broadcloth, at \$5 per yd. ; and on presenting his bill for 90 days' work, commencing on the 25th of April, and ending Sept. 30th, it is thus adjusted : E gives up G's note, dated Jan. 1st, for \$100, with use on which there is an endorsement, dated June 16th following, for \$60, and the settlement is made on 30th Sept., when G received his bill and the balance due to him in cash. How much was it ? *Ans. \$17,22 cts.*

197. A and B are equal owners of the ship Boxer. A, as agent, receives for freight \$5089,60, and his bill against the ship is \$5140,80 ; B's bill is \$429,20. What is the balance on stating an account with each ? *Ans. \$189,04 $\frac{1}{4}$  due to B.*

198. In order to close a voyage, sundry articles and small stores from the schooner John, owned equally by A, B, C, and D, were sold at auction, and purchased chiefly by the owners, viz., A \$13,38, B \$82,50, C \$63,66, and for cash \$6,25. It is required to adjust this business.

<i>Ans.</i>	$\begin{cases} \$28,06\frac{1}{4} cts \text{ due to } A. \\ 41,44\frac{1}{4} cts. " D. \\ 41,05\frac{1}{4} cts. \text{ due from } B \\ 22,21\frac{1}{4} cts. " " C. \\ 6,25 cts. \text{ in cash.} \end{cases}$
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199. C D, owner of the fishing schooner Lyon, of 100 tons, agrees with J P and 12 fishermen to fit her for the Labrador fishery on shares ; the vessel to draw  $\frac{1}{4}$  part of the proceeds after deducting the *great general* for salt, boats, seines, nets, and candles, which in this case amounted to \$850 ; and of the other  $\frac{1}{4}$  each man was to receive  $\frac{1}{13}$  part after deducting the *small general* for provisions and small stores, amounting to \$550. They were absent 4 months, and returned with a cargo of fish and oil, viz. :

1000 quintals, which sold at 13s—\$2166,67 cts.

28 bbls. oil, " \$12 336,00

Bounty received from government, 360,00

The tonnage bounty is \$4 per ton, but in no case to exceed \$360.

C D also, as owner of the sch'r. Mary, of 47 ons, agreed with S C and 5 fishermen to fit her for a mackerel voyage on shares. The owner to draw  $\frac{1}{4}$  of the proceeds after deducting the *great general*, which amounted to \$160 ; each man to receive  $\frac{1}{6}$  of the other  $\frac{1}{4}$  after deducting the *small general*, which amounted to \$52. They were absent 6 weeks, and returned with 125 barrels of mackerel, viz. :

60 bbls. No. 1, which sold at \$5,00— \$300

50 " No. 2, " " 4,50— 225

15 " No. 3, " " 4,00— 60

Required, C D's share of the proceeds for his vessel and supplies, and the respective shares of the fishermen.

Ans. 
$$\begin{cases} C D's \text{ part as owner, } \$609,41 \text{ cts.} \\ " " \text{ for supplies, } 1612,00 \text{ cts.} \\ J P \& Co. \text{ the Lyon—each } 73,80 \text{ cts.} \\ S C \& Co. " Mary " 44,45 \text{ cts.} \end{cases}$$

200. Three carpenters, A, B, and C, agree with G to build a store and find the materials for \$1000, of which \$600 were to be paid in advance, and the remainder when the work was finished. B and C take \$50 each of the first payment. When the work was completed, it appeared by A's account, who received the money and paid the bills, for which he was allowed a compensation of \$10, that he had paid \$648,95, exclusive of the payments to B and C, and that he had worked 63 days; B worked 51 days, and he was allowed \$20 for the use of his shop, &c.; C worked 60 days, and his bill for boarding the men they hired was \$68,75; A, on settling with G, and allowing him \$23,15 charged to B and \$17,48 charged to C, receives the balance in cash; and, on exhibiting his statement of the business to B and C, he pays to each the balance due. How much did they make per day, and how was the last payment disposed of?

Ans. 
$$\begin{cases} \$1,45 \text{ cts. per day.} \\ B \text{ received } \$20,80 \text{ cts.} \\ C " 88,27 \text{ cts.} \\ A " 250,30 \text{ cts.} \end{cases}$$

201. A supercargo invested certain sales in purchasing 1425 bushels of corn in a southern port, of which

A's sales purchased 630 bushels,

B's " " 342 " "

C's " " 216 " "

D's " " 105 " "

E's " " 132 " "

At his return to —, the owners, doubting whether the measure would hold out, agreed that each should take at his option, and adjust for excess or deficiency of his share, at 50 cents per bushel; when

A took 600 bushels,

B " 300 "

C took 200 bushels,  
 D " 90 "  
 E " 100 "

and 59 bushels remaining were sold by the supercargo for \$29,50 in cash. Required, the result of his statement to the owners.

*Ans.* 
$$\begin{array}{rcl} \$11,88 & \text{due to } & B \\ 2,24 & " & C \\ 4,70 & " & D \\ 12,48 & " & E \\ \hline 1,80 & \text{due from } & A \\ 29,50 & \text{in cash.} & \\ \hline \$31,30 & & \end{array}$$

202. A owned  $\frac{7}{24}$ , B  $\frac{3}{24}$ , C  $\frac{8}{24}$ , and D  $\frac{6}{24}$ , of the ship Caroline. A acted as agent in the outfitting of the ship for New Orleans, toward which B's bill was \$720, C's \$1920, and D's \$1440. Some days after her departure A became bankrupt, and it appeared that there was still due to the creditors of the ship and cargo \$7413.84. At a meeting of the owners C was appointed to apportion the shares for the deficiency, and also to subdivide the bankrupt's part on them, which they are to make good in consequence of his failure. On C's exhibiting his statement, a settlement was made by payments in cash. How much did each pay?

*Ans.* 
$$\begin{array}{rcl} B & \text{paid } & \$1308.32 \\ C & " & 3488.87 \\ D & " & 2616.65 \end{array}$$

203. The ship Levant, employed in the flour trade, was owned equally by John Smith, of Baltimore, and Peter Jones, of Boston, who, as agent, sold  $\frac{1}{8}$  of her to Captain Hilton for cash, engaging to freight his part at 50 cents per barrel, gave him 3 per cent. privilege and \$25 per month as master of her. In this business he made three voyages from Boston to Baltimore, delivering at each time 1000 barrels in Boston. His share of passage money was,

On the 1st voyage \$10,20 out, and \$8,40 home,  
 " 2d " 9,40 " 7,00 "  
 " 3d " 16,60 " 8,40 "

At the end of five months it appeared by Peter Jones's account, that the disbursements for the ship amounted to \$696.96. The premium of insurance effected by him for

Captain Hilton was \$20. The small stores remaining on board were sold for \$50,24. On settlement, the balance in his favour was paid to him in cash, and he was furnished with a copy of the ship's account, and of his own with the owners. The amount of Captain Hilton is required?

*Ans. \$311,034.*

204. A, B, and C agreed to build a factory, to be concerned each one-third; A to be agent at \$1000 per annum, to be paid quarterly. At commencing, each of them pays \$1000.

In 3 months A pays \$500		
" 4 "	C "	610
" 6 "	B "	725
" 7 "	C "	1200
" 9 "	B "	1675
" 12 "	A "	1630
" 14 "	B "	2115
" 17 "	A "	505 -
" 24 "	C "	2983

at which time the factory is completed: by agreement, interest is to be allowed on the several advances; and as the agent received nothing for his services during the time, the instalments of his salary are to be considered as advances on his part as they became due. Required, the balances as exhibited by the treasurer's statement.

*Ans* { \$64,13 $\frac{1}{3}$  due to C.  
          { 16,10 $\frac{2}{3}$  " " A.  
          { 80,24 $\frac{1}{3}$  due from B.

205. A, B, and C are jointly concerned in trade. At commencing, A advances \$1500, B \$2100, and C \$3000. On balancing their books at the end of 12 months, their nett stock amounted to \$8850. A stands indebted to the company on his private account \$300, and B \$180, and C is creditor for \$480; by their contract, they are allowed interest for their unequal advances of stock at 6 per cent., and then share the gain equally. Required, the share of each in the present stock, as exhibited in their respective accounts.

*Ans.* { A owns \$1908,  
          { B " 2664,  
          { C " 4278.

206. Three persons, A, B, and C, agreed to trade in company with a joint stock of \$8957. A's share is  $\frac{6}{13}$ , B's  $\frac{1}{3}$ ,

and C's  $\frac{3}{13}$ ; at the end of a year, when they balanced their books, there appeared a loss of \$1157; C, being discouraged at the prospect, desired to withdraw from the concern, and the other partners proposed to take the risk of recovering the outstanding debts, and pay him his share in the present stock, on being allowed a discount of  $17\frac{1}{4}$  per cent., to which C consented, and he is paid accordingly: required, the result of this concern, as shown by the company's books at closing.

*Ans.*  $\left\{ \begin{array}{l} A \text{ now owns } \frac{3}{5} \text{ valued } \$4491, \\ B \text{ " } \frac{2}{5} \text{ " } 2994, \\ C \text{ receives for his part } 1485. \end{array} \right.$

207. Estimate of a voyage for the ship Jackson, from Boston to Batavia, viz.: suppose the ship and appurtenances to be worth \$16000; outfit, \$2600; specie in dollars, \$136500; premium on them to be 2 per cent.; interest on capital for 16 months at 6 per cent. per annum; coffee to be at \$21 per picul in Batavia, and specie at par, and the whole invested. The disbursements there amounting to \$2300, being paid out of the owners' funds in Batavia. Supposing each picul to weigh in the United States 130 lbs., and to sell at 22 cents per lb., and the ship to be valued at \$14000 on her return, what would it leave for expenses and profit? *Ans.* \$20785,60.

THE  
READY RECKONER,  
FOR  
TIMBER MEASURE.

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EXPLANATION.

IN the following tables the odd inches are omitted in every piece of timber that is under *eight*; so that a piece of timber of 7 feet long, and 3 by 3 thick, makes 5 feet 3 inches long.

So, likewise, all odd inches in every piece of timber that is above *eight* inches, I make one foot; so that a piece of 7 feet long, and 3 by 5 thick, makes 8 feet 9 inches.

TABLE OF TIMBER MEASURE.

7 Feet long.				3 by 12		24	7 by 10	47
3 by 3	5	6 by 7	24	4	4	11	7	51
3	4	7	6 8	28	4	5	13	56
3	5	9	6 9	31	4	6	16	8 8 43
3	6	10	6 10	35	4	7	19	8 9 48
3	7	12	6 11	38	4	8	21	8 10 53
3	8	14	6 12	42	4	9	24	8 11 59
3	9	16	7 7	28	4	10	27	8 12 64
3	10	17	7 8	33	4	11	29	9 9 54
3	11	19	7 9	37	4	12	32	9 10 60
3	12	21	7 10	41	5	5	17	9 11 66
4	4	9	7 11	45	5	6	20	9 12 72
4	5	12	7 12	49	5	7	23	10 10 67
4	6	14	8 8	37	5	8	27	10 11 73
4	7	16	8 9	42	5	9	30	10 12 80
4	8	19	8 10	47	5	10	33	11 11 81
4	9	21	8 11	51	5	11	37	11 12 88
4	10	23	8 12	56	5	12	40	12 12 96
4	11	26	9 9	47	6	6	24	
4	12	28	9 10	52				
9 Feet long.								
5	5	14	9 11	58				
5	6	17	9 12	63	3 by 3	7	6 by 7	31
5	7	20	10 10	58	3	4	9	8 36
5	8	23	10 11	64	3	5	11	6 9 40
5	9	26	10 12	70	3	6	13	6 10 45
5	10	29	11 11	70	3	7	16	6 11 49
5	11	32	11 12	77	3	8	18	6 12 54
5	12	35	12 12	84	3	9	20	7 7 37
6	6	21			3	10	22	7 8 42
8 Feet long.								
3 by 3	6	6 by 7	28	4	4	11	25	7 9 47
3	4	8	6 8	32	4	5	12	7 11 58
3	5	10	6 9	36	4	6	15	7 12 63
3	6	12	6 10	40	4	7	18	8 48
3	7	14	6 11	44	4	8	21	8 54
3	8	16	6 12	48	4	9	24	8 10 60
3	9	18	7 7	33	4	10	27	8 11 66
3	10	20	7 8	37	4	11	30	8 12 72
3	11	22	7 9	42	4	12	33	9 9 61
							36	9 10 67







3	by 8	36	6	by 12	108	4	by 12	76	9	by 10	142
3	9	40	7	7	73	5	5	39	9	11	157
3	10	45	7	8	84	5	6	47	9	12	171
3	11	49	7	9	94	5	7	55	10	10	158
3	12	54	7	10	105	5	8	63	10	11	174
4	4	24	7	11	115	5	9	71	10	12	190
4	5	33	7	12	126	5	10	79	11	11	191
4	6	36	8	8	94	5	11	87	11	12	209
4	7	42	8	9	108	5	12	95	12	12	228
4	8	48	8	10	120	6	6	57			
4	9	54	8	11	132						
4	10	60	8	12	144						
4	11	66	9	9	121	3	by 3	15	6	by 7	70
4	12	72	9	10	135	3	4	20	6	8	80
5	5	37	9	11	148	3	5	25	6	9	90
5	6	45	9	12	162	3	6	30	6	10	100
5	7	52	10	10	150	3	7	35	6	11	110
5	8	60	10	11	165	3	8	40	6	12	120
5	9	67	10	12	180	3	9	45	7	7	82
5	10	75	11	11	181	3	10	50	7	8	93
5	11	82	11	12	198	3	11	55	7	9	105
5	12	90	12	12	216	3	12	60	7	10	117
6	6	54				4	4	27	7	11	128
						4	5	33	7	12	140
						4	6	40	8	8	107
3	by 3	14	6	by 7	66	4	7	47	8	9	120
3	4	19	6	8	76	4	8	53	8	10	133
3	5	24	6	9	85	4	9	60	8	11	147
3	6	28	6	10	95	4	10	67	8	12	160
3	7	33	6	11	104	4	11	73	9	9	135
3	8	38	6	12	114	4	12	80	9	10	150
3	9	43	7	7	77	5	5	42	9	11	165
3	10	45	7	8	89	5	6	50	9	12	180
3	11	52	7	9	100	5	7	58	10	10	167
3	12	57	7	10	111	5	8	67	10	11	183
4	4	25	7	11	122	5	9	75	10	12	200
4	5	32	7	12	133	5	10	83	11	11	202
4	6	38	8	8	101	5	11	92	11	12	220
4	7	44	8	9	114	5	12	100	12	12	240
4	8	51	8	10	127	6	6	60			
4	9	57	8	11	139						
4	10	63	8	12	152	3 by 3	16	6 by 7	173		
4	11	69	9	9	128						

21 Feet long.

3	by 4	21	6	by 8	84	4	by 7	51	8	by 9	132
3	5	26	6	9	94	4	8	58	8	10	146
3	6	31	6	10	105	4	9	66	8	11	161
3	7	36	6	11	115	4	10	73	8	12	176
3	8	42	6	12	126	4	11	80	9	9	148
3	9	47	7	7	86	4	12	88	9	10	165
3	10	52	7	8	98	5	5	46	9	11	181
3	11	57	7	9	110	5	6	55	9	12	198
3	12	63	7	10	122	5	7	64	10	10	183
4	4	28	7	11	135	5	8	73	10	11	202
4	5	35	7	12	147	5	9	82	10	12	220
4	6	42	8	8	112	5	10	92	11	11	222
4	7	49	8	9	126	5	11	101	11	12	242
4	8	56	8	10	140	5	12	110	12	12	264
4	9	63	8	11	154	6	6	65			
4	10	70	8	12	168						
4	11	77	9	9	141						
4	12	84	9	10	157	3	by 3	17	6	by 7	80
5	5	44	9	11	173	3	4	23	6	8	92
5	6	52	9	12	189	3	5	29	6	9	103
5	7	61	10	10	175	3	6	34	6	10	115
5	8	70	10	11	192	3	7	40	6	11	126
5	9	78	10	12	210	3	8	46	6	12	138
5	10	87	11	11	212	3	9	52	7	7	94
5	11	96	11	12	231	3	10	57	7	8	107
5	12	105	12	12	252	3	11	63	7	9	121
6	6	63				3	12	69	7	10	134
						4	4	31	7	11	147
						4	5	38	7	12	161
3	by 3	16	6	by 7	77	4	6	46	8	8	123
3	4	22	6	8	88	4	7	52	8	9	138
3	5	27	6	9	99	4	8	61	8	10	153
3	6	32	6	10	110	4	9	69	8	11	169
3	7	38	6	11	121	4	10	77	8	12	184
3	8	44	6	12	132	4	11	84	9	9	155
3	9	49	7	7	90	4	12	92	9	10	178
3	10	55	7	8	102	5	5	48	9	11	190
3	11	60	7	9	115	5	6	57	9	12	207
3	12	66	7	10	128	5	7	67	10	10	188
4	4	29	7	11	141	5	8	77	10	11	211
4	5	36	7	12	154	5	9	86	10	12	230
4	6	44	8	8	117	5	10	96	11	11	232

5	by	11	105	11	by	12	253	3	by	11	68	7	by	9	131								
5	12	115	12	12			276	3	12	75	7	10		145									
6	6	69						4	4	33	7	11		160									
24 Feet long.																							
3	by	3	18	6	by	7	84	4	7	58	8	9		150									
3	4	24	6	8			96	4	8	66	8	10		166									
3	5	30	6	9			108	4	9	75	8	11		183									
3	6	36	6	10			120	4	10	83	8	12		200									
3	7	42	6	11			132	4	11	91	9	9		168									
3	8	48	6	12			144	4	12	100	9	10		188									
3	9	54	7	7			98	5	5	52	9	11		206									
3	10	60	7	8			112	5	6	63	9	12		225									
3	11	66	7	9			126	5	7	72	10	10		208									
3	12	72	7	10			140	5	8	83	10	11		229									
4	4	32	7	11			154	5	9	93	10	12		250									
4	5	40	7	12			168	5	10	104	11	11		252									
4	6	48	8	8			128	5	11	114	11	12		275									
4	7	56	8	9			144	5	12	125	12	12		300									
4	8	64	8	10			160	6	6	75													
4	9	72	8	11			176	26 Feet long.															
4	10	80	8	12			192	3	by	3	20	6	by	7	91								
4	11	88	9	9			162	3	4	26	6	8		104									
4	12	96	9	10			180	3	5	32	6	9		117									
5	5	49	9	11			198	3	6	39	6	10		130									
5	6	60	9	12			216	3	7	45	6	11		143									
5	7	70	10	10			200	3	8	52	6	12		150									
5	8	80	10	11			220	3	9	58	7	7		106									
5	9	90	10	12			240	3	10	65	7	8		121									
5	10	100	11	11			244	3	11	71	7	9		136									
5	11	110	11	12			264	3	12	78	7	10		151									
5	12	120	12	12			288	4	4	34	7	11		167									
6	6	72						4	5	43	7	12		182									
25 Feet long.																							
3	by	3	19	6	by	7	88	4	7	60	8	9		156									
3	4	25	6	8			100	4	8	69	8	10		173									
3	5	31	6	9			113	4	9	78	8	11		190									
3	6	38	6	10			125	4	10	86	8	12		208									
3	7	43	6	11			138	4	11	95	9	9		175									
3	8	50	6	12			150	4	12	104	9	10		195									
3	9	56	7	7			102	5	5	54	9	11		214									
3	10	63	7	8			116	5	6	65	9	12		234									

5	by	7	76	10	by	10	212	3	by	6	42	6	by	10	140
5	8	86	10	11	238	3	7	49	6	11	154				
5	9	97	10	12	260	3	8	56	6	12	168				
5	10	100	11	11	262	3	9	63	7	7	114				
5	11	119	11	12	286	3	10	70	7	8	131				
5	12	130	12	12	312	3	11	77	7	9	147				
6	6	78				3	12	84	7	10	163				
27 Feet long.															
3	by	3	20	6	by	7	94	4	6	56	8	8	149		
3	4	27	6	8	108	4	7	65	8	9	168				
3	5	34	6	9	121	4	8	75	8	10	187				
3	6	40	6	10	135	4	9	84	8	11	205				
3	7	47	6	11	148	4	10	93	8	12	224				
3	8	54	6	12	162	4	11	103	9	9	189				
3	9	61	7	7	110	4	12	112	9	10	210				
3	10	67	7	8	126	5	5	58	9	11	231				
3	11	74	7	9	142	5	6	70	9	12	252				
3	12	81	7	10	157	5	7	82	10	10	233				
4	4	36	7	11	173	5	8	93	10	11	257				
4	5	45	7	12	189	5	9	105	10	12	280				
4	6	54	8	8	144	5	10	117	11	11	282				
4	7	63	8	9	162	5	11	128	11	12	308				
4	8	72	8	10	180	5	12	140	12	12	336				
4	9	81	8	11	198	6	6	84							
4	10	90	8	12	216										
4	11	99	9	9	182										
4	12	108	9	10	202	3	by	3	22	4	by	9	87		
5	5	56	9	11	223	3	4	29	4	10	97				
5	6	67	9	12	243	3	5	36	4	11	106				
5	7	79	10	10	225	3	6	43	4	12	116				
5	8	90	10	11	247	3	7	51	5	5	60				
5	9	101	10	12	270	3	8	58	5	6	72				
5	10	112	11	11	272	3	9	65	5	7	84				
5	11	124	11	12	297	3	10	72	5	8	97				
5	12	135	12	12	324	3	11	80	5	9	108				
6	6	81				3	12	87	5	10	121				
28 Feet long.															
3	by	3	21	6	by	7	98	4	6	56	6	6	87		
3	4	28	6	8	112	4	7	68	6	7	101				
3	5	35	6	9	126	4	8	77	6	8	116				















